NPL-429-2-8-R6

TNRCC

Protecting Texas by Reducing and Preventing Pollution

HRS DOCUMENTATION RECORD

State Road 114 Ground Water Plume
Levelland, Hockley County, Texas
TXS FN0 605 177

Volume I of III

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VI

Prepared in cooperation with the U.S. Environmental Protection

July 1999

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
EPA NATIONAL PRIORITIES LIST (NPL) July 1999
OSWER/OERR State, Tribal, and Site Identification Center Washington, DC 20460

STATE ROAD 114 GROUND WATER PLUME
Levelland, Texas

The State Road 114 Ground Water Plume site consists of the contaminated ground water plume in the aquifer underlying the western boundary of the City of Levelland, Hockley County, Texas, approximately 31 miles due west of Lubbock. The ground water is primarily contaminated with 1,2-dichloroethane (1,2-DCA) and vanadium. Impacts from 1,2-DCA, vanadium, and/or metals contamination have been identified in 28 ground water supply wells, and a number of the City of Levelland's public water supply wells are in the immediate migration path of the ground water plume.

Contamination by 1,2-DCA was first detected by the Texas Department of Health in June 1990 in a sample collected from the Farmers Co-op Elevator Association well. Contamination by 1,2-DCA was again detected in this well the following year. Subsequent investigations by the Texas Natural Resources Conservation Commission (TNRCC) and EPA from 1995 through 1998 identified impacts from 1,2-DCA, vanadium, and/or metals contamination in 28 ground water wells in the area, including: 19 residential wells, five business wells, three City of Levelland public water supply wells, and one irrigation well. During these investigations, efforts were made to locate the source of the ground water contamination. Despite these efforts, however, no conclusive evidence was identified confirming one or more contaminant sources.

In the absence of a specific source of contamination, the State Road 114 Ground Water Plume site has been identified as a plume of contaminated ground water in the Ogallala Aquifer where 28 wells have significant levels of contamination. The plume extends from west to east (in the direction of ground water flow) along West State Highway 114 for approximately 1½ miles from the former Motor Fuels Corporation (MFC) property to the City of Levelland municipal park. The ground water plume is approximately a mile wide, bounded roughly by Ellis Road to the north and Houston Avenue to the south. Analyses of samples collected during site investigations to date indicate 1,2-DCA concentrations as high as 182 micrograms per liter (µg/l) and vanadium concentrations as high as 490 µg/l. EPA has established a maximum contaminant level (MCL) for 1,2-DCA in drinking water of 5 µg/l. No MCL currently exists for vanadium; however, the Superfund Removal Action Level for vanadium is 250 µg/l.

The Ogallala Aquifer is the principal source of drinking water for residents in Hockley County. Site investigations conducted by the TNRCC and the EPA to date have identified 15 wells contaminated with 1,2-DCA and vanadium, one well with 1,2-DCA only, and 12 wells with vanadium only. The Texas Department of Health has advised owners of the impacted wells that use of the well water is unsafe. EPA is partnering with the TNRCC to address the hazards posed by the use of this water and has initiated a program to install and maintain ground water filtration systems for these wells. Filtration units have been installed on 14 of the 16 wells contaminated with 1,2-DCA, including the Farmers Co-op Elevator Association well. The remaining two wells are not used for drinking water. Filtration systems have also been installed at three businesses where elevated levels of vanadium or metals contamination have impacted ground water quality.

The City of Levelland draws approximately one-third of its drinking water from the Ogallala Aquifer and obtains the remainder of its water supply from surface water sources. The city operates 17 public water supply wells, all of which are located downgradient and within 4 miles of the center of the ground water plume. The city's ground water wells serve 4,200 people of a total population of 14,000. Although 1,2-DCA contamination has not been detected in any of the active public wells to date, elevated levels of vanadium contamination have been documented in two of the city wells. A third public well was closed during the 1960s due to taste and odor problems. Contamination by 1,2-DCA has been detected in this well. Given their proximity and location in the immediate migration path of the ground water plume, all of the city's active public water supply wells are considered potentially susceptible to contamination.

[The description of the site (release) is based on information available at the time the site was scored. The description may change as additional information is gathered on the sources and extent of contamination. See 56 FR 5600, February 11, 1991, or subsequent FR notices.]

HRS Documentation Record

State Road 114 Ground Water Plume
Levelland, Hockley County, Texas
TXS FN0 605 177

Prepared in cooperation with the

U.S. Environmental Protection Agency

Region VI

Prepared by

Protecting Texas
by Reducing and Preventing Pollution

Texas Natural Resource Conservation Commission
Site Evaluation/Remediation/Restoration Section
Superfund Site Discovery and Assessment Staff
Austin, Texas

July 1999

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grants from the U.S. Environmental Protection Agency.

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TABLES

FIGURES

ATTACHMENTS

HRS DOCUMENTATION RECORD - REVIEW COVER SHEET

SITE NAME: STATE ROAD 114 GROUND WATER PLUME

CONTACT PERSON:

Documentation Record: Brenda Nixon Cook, USEPA 214/665-7436
Region 6 NPL Coordinator

Pathway, Components, or Threats Not Evaluated

Surface Water Pathway

The Surface Water Overland/Flood Migration Component, and Ground Water to Surface Water Migration Component, were not scored because the site scored on a contaminated ground water plume. There is no observed release for the Surface Water Pathway.

Soil Exposure Pathway

The Resident Population Threat, and Nearby Population Threat, were not scored because the site scored on a contaminated ground water plume. There is no observed release for the Soil Exposure Pathway.

Air Migration Pathway

The Air Migration Pathway was not scored because the site scored on a contaminated ground water plume. There is no observed release for the Air Migration Pathway.

NOTES TO THE READER

The following rules were used when citing references in the HRS Documentation Record:

1. All references attached to this report have been stamped with a designated page number (example: Ref. 1, p. 10 = 010010).

2. The State predecessor agencies: Texas Water Quality Board (TWQB), Texas Department of Water Resources (TDWR), Texas Water Commission (TWC), and Texas Air Control Board (TACB), referred to throughout this report are now known as the Texas Natural Resource Conservation Commission (TNRCC). The new agency, TNRCC, became effective September 1, 1993, as mandated under State Senate Bill 2 of the 73rd Regular Legislative Session.

HRS DOCUMENTATION RECORD

Name of Site: State Road 114 Ground Water Plume **Date Prepared:** 07/99

CERCLIS Site ID Number: TXS FN0 605 177

Site Specific Identifier: 06HQ

Street Address of Site: W. State Road 114

City, County, State: Levelland, Hockley County, Texas

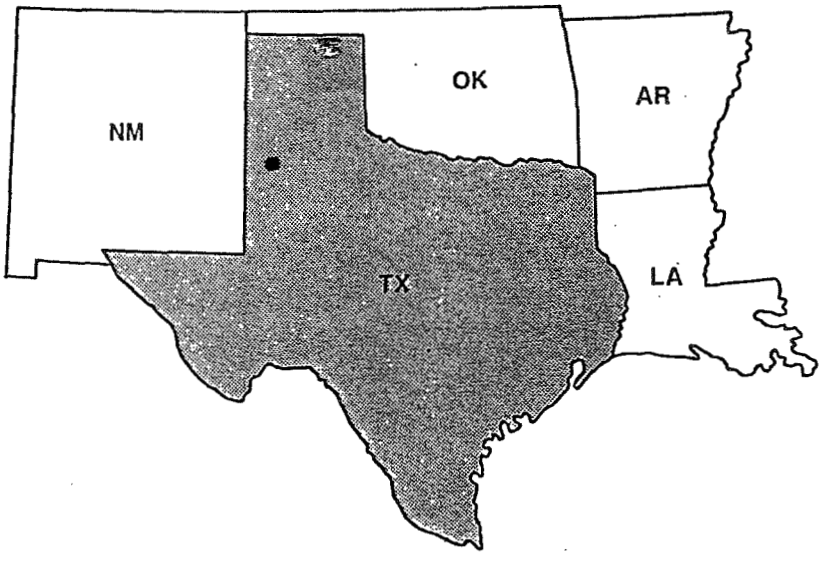
General Location in the State:

The site extends from west to east along West State Highway 114 for approximately 1 ½ miles from the former Motor Fuels Corporation (MFC) property to the City of Levelland Municipal Park, Levelland, Texas. The ground water plume is approximately one mile wide. The Municipal Park forms the western city limit boundary of Levelland (population 13,986, 1990 Census, Ref. 46, p. 4), Hockley County, Texas, due west of Lubbock, Texas, in the Texas Panhandle (see Figure 1, Regional Location Map and Figure 2, Site Location Map).

Topographic Map: US Geological Survey 7.5 Minute Topographic Map, Levelland West, Texas Quadrangle

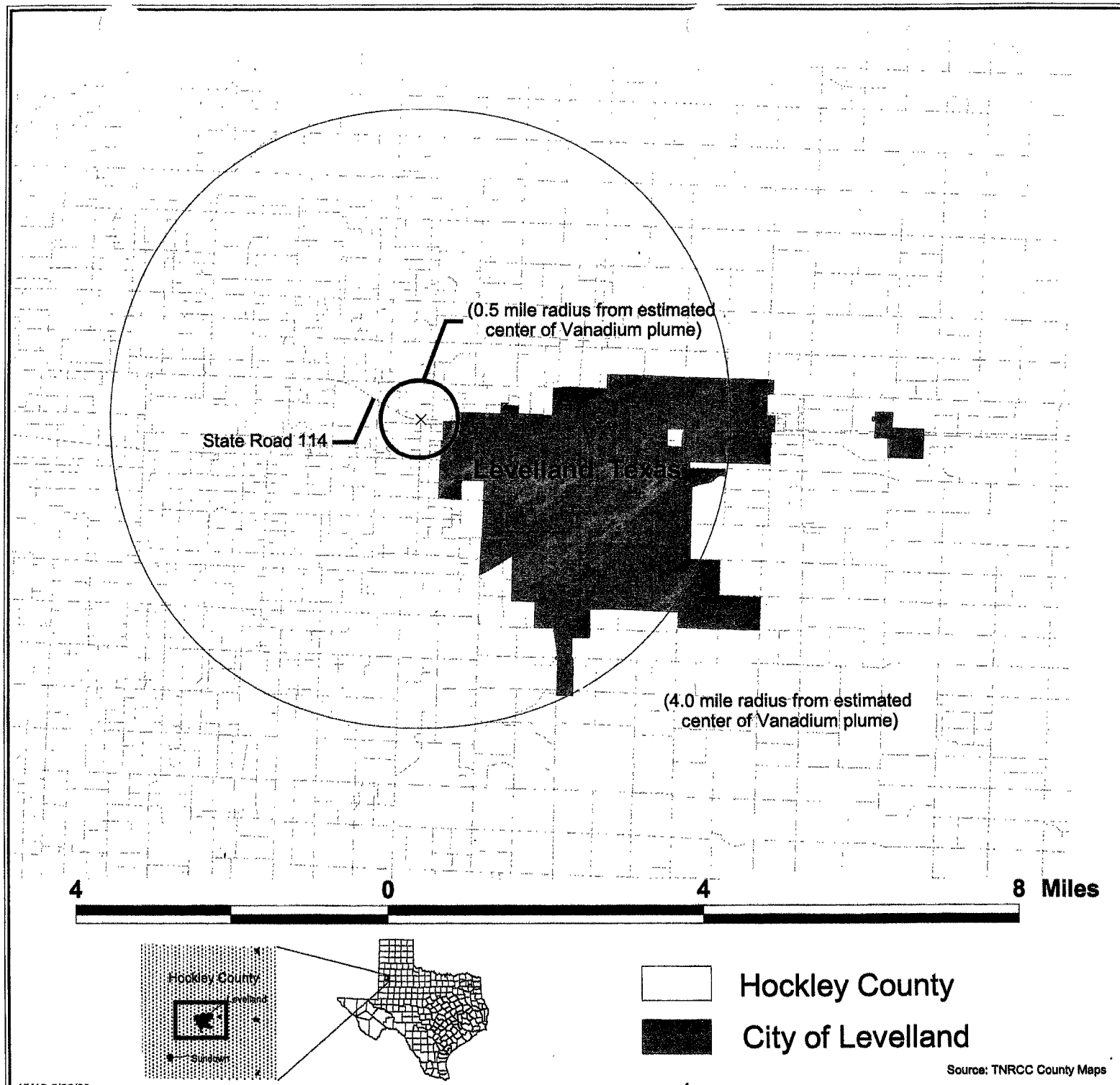
Latitude: *33° 35' 59.58" North* **Longitude:** 102° 24' 20.02" West
(See Attachment A, Topographic Maps)

EPA Region 6



Pathway Scores:
Groundwater Migration Pathway - 84.81
Surface Water Migration Pathway - NE
Soil Exposure Pathway - NE
Air Migration Pathway - NE
NE - Not Evaluated

HRS SITE SCORE: 42.41



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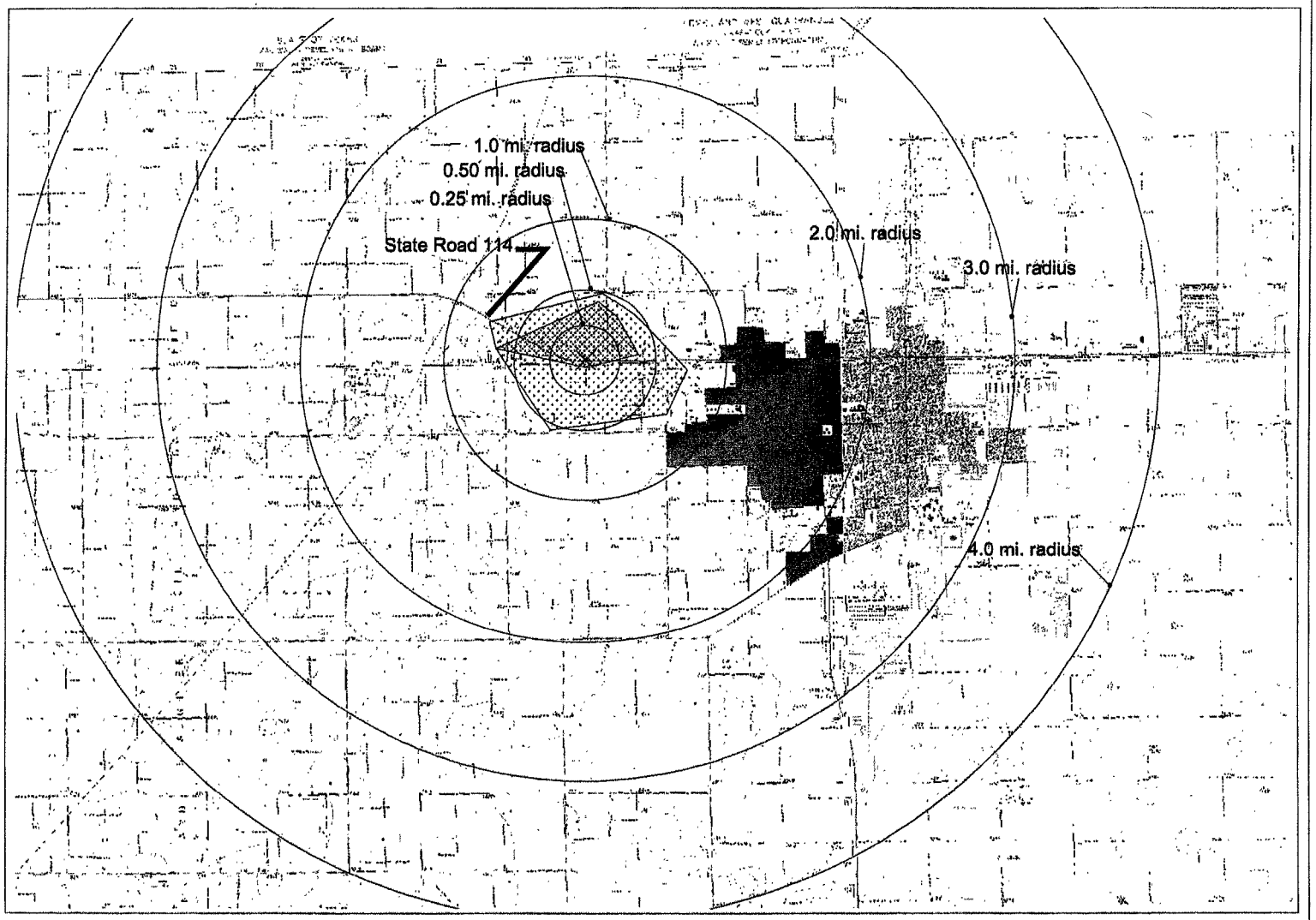
State Road 114 Ground Water Plume TXSFN0605177

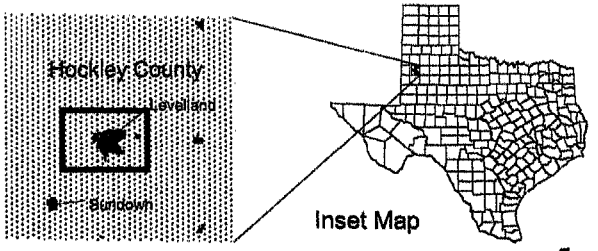
Levelland, (Hockley Co.), Texas

N

HRS Figure 1 Regional Location Map

KWC 5/26/99





Source: United States Geological Survey
7.5 Minute Series Topographic Map

TNRCC *Protecting Texas by Reducing and Preventing Pollution*

State Road 114 Ground Water Plume TXSFN0605177

Levelland, (Hockley Co.), Texas

Vanadium Plume
DCA Plume

N

HRS Figure 2 Site Location Map

ern 5/14/99

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2.	U. S. Environmental Protection Agency, *Superfund Chemical Data Matrix (SCDM).* June, 1996.
3.	U.S. Environmental Protection Agency. *Screening Site Inspection Report - Motor Fuels Corporation Site*, October, 1996. 394 pages.
4.	U.S. Environmental Protection Agency. *Expanded Site Inspection Report - Motor Fuels Corporation Site*, September 1997. 395 pages.
5.	Tomroy, Lucky L., Graduate Student, Texas Technological College. *Pollution of Underground Water In Levelland, Texas, and Vicinity*, June 1957. 43 pages.
6.	Anne Strahl, Texas Water Commission. Record of Communication with Burnet Roberts, local resident, City of Levelland. October 22, 1992. 1 page.
7.	Anne Strahl, Texas Water Commission. Record of Communication with H.B. Wright, former Motor Fuels Corporation employee, City of Levelland. October 26, 1992. 1 page.
8.	Kelly W. Cook, Texas Natural Resource Conservation Commission. Record of Communication with Douglas Durham, local resident, City of Levelland. December 2, 1992. 1 page.
9.	Randy J. Ammons and Eric H. Miller, Texas Water Commission, District 2. Interoffice Memorandum to Stennie Meadours, Superfund and Emergency Response Unit Section, Hazardous & Solid Waste Division, and Larry L. Smith, District Manager, District 2. August 26, 1991 and November 26, 1991. 13 pages.
10.	Kelly Cook, Texas Water Commission, Superfund Site Discovery and Assessment Team. Interoffice Memorandum to Larry L. Smith, District Manager, District 2. December 4, 1992. 39 pages.
11.	Texas Water Commission. Petroleum Storage Tank Release Incident Report for PST ID No. 94626, Edwards Transport, Inc. January 24, 1990. 11 pages.
12.	Hockley County News and Daily Sun News. Various newspaper articles regarding Motor Fuels Corporation. September 15, 1939 through July 20, 1954. 17 pages.

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14.	U.S. Environmental Protection Agency. *Region 6 Environmental Laboratory Results for Motor Fuels Corporation Site, Samples 8FAXBW02-01 through 8FAXBW02-22.* September 22, 1998. 129 pages.
15.	U.S. Environmental Protection Agency. Supplemental Expanded Site Inspection Field Log Book notes and photographs. November 9 - 11, 1998. 20 pages. Record of Communication to William Rhotenberry from Allan Seils.
16.	U.S. Environmental Protection Agency, Region 6, Houston Branch. *Case Number 26637, Samples Designation Group FDG41, CLP Data Review and Analyses Data Package.* December 8, 1998. 46 pages.
17.	U.S. Environmental Protection Agency, Region 6, Houston Branch. *Case Number 26637, Samples Designation Group MFGL35, CLP Data Review and Analyses Data Package.* December 8, 1998. 27 pages.
18.	U.S. Environmental Protection Agency. Supplemental Expanded Site Inspection Field Log Book notes and photographs. December 7 - 9, 1998. 24 pages.
19.	U.S. Environmental Protection Agency, Region 6, Houston Branch. *Case Number 26711, Samples Designation Group FEN46, CLP Data Review and Analyses Data Package.* From: Dr. Melvin Ritter, ESAT RPO, 6MD-HC To: B. Rhotenberry, 6SF-RA. January 11, 1999. 64 pages.
20.	U.S. Environmental Protection Agency, Region 6, Houston Branch. *Case Number 26711, Samples Designation Group MFGJ43, CLP Data Review and Analyses Data Package.* From: Dr. Melvin Ritter, ESAT RPO, 6MD-HC To: B. Rhotenberry, 6SF-RA. January 4, 1999. 25 pages.
21.	U.S. Environmental Protection Agency. *Region 6 Environmental Laboratory Results for Motor Fuels Corporation Site, Samples 6TFADW02-01 through 6TFADW02-10.* December 6, 1995. 76 pages.
22.	U.S. Environmental Protection Agency. *Region 6 Environmental Laboratory Results for Motor Fuels Corporation Site, Samples 7FAXDW13-01 through 7FAXDW13-11.* April 15, 1997. 71 pages.
23.	National Safety Council, Environmental Health Center. *1,2-Dichloroethane (C2H4C12) Chemical Backgrounder*, July 1, 1997. 3 pages.

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25.	Agency for Toxic Substances and Disease Registry, Division of Toxicology. *Vanadium*, September 1995. 5 pages.
26.	U.S. Environmental Protection Agency. *Numeric Removal Action Levels For Contaminated Drinking Water Sites*, April 1997. 16 pages.
27.	Texas Natural Resource Conservation Commission. *Implementation of the Existing Risk Reduction Rule, 30 Texas Administrative Code (TAC) Chapter 335*, Interoffice Memorandum to Remediation Division Staff. July 23, 1998. 110 pages.
28.	Texas Department of Health. *Health Consultation, Vanadium Groundwater Plume Texas*, May 6, 1999. 10 pages.
29.	Texas Department of Water Resources. Report 258. *Analytical Study of the Ogallala Aquifer in Ochiltree County, Texas*, October 1980. 6 pages.
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31.	Texas Natural Resource Conservation Commission. *Data Usability Assessment - Motor Fuels Corporation and Background Data Tables*, April 22, 1999. 8 pages.
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37.	Cook, Kelly W., Texas Natural Resource Conservation Commission. Record of Communication with Kenneth Rumbaugh, Water Superintendent, City of Levelland. October 22, 1992. 1 page.
38.	Ingham, Greg, City Manager, City of Levelland. Letter to Larry Smith, District Manager, Texas Water Commission, Region 2. December 31, 1990. 62 page.
39.	U.S. Environmental Protection Agency. *Drinking Water and Health, Technical Factsheet on: 1,2-Dichloroethane.* January 27, 1998. 5 pages.
40.	Seils, Allan M., Texas Natural Resource Conservation Commission. Record of Communication with Kenneth Rumbaugh, Water Superintendent, City of Levelland. June 29, 1999. 1 page.
41.	Seils, Allan M., Texas Natural Resource Conservation Commission. Telephone Memo To The File with Mrs. Wayne Mathies, Levelland, Texas. May 13, 1999. 1 page.
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43.	Thompson, J.D., Texas Natural Resource Conservation Commission. Telephone Memo To The File with David Terry, Community Support, Texas Natural Resource Conservation Commission. September 13, 1998. 1 page.
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45.	Seils, Allan M., Texas Natural Resource Conservation Commission. Record of Communication with Terry Spears, Spears Pump, Inc., Levelland, Texas. June 23, 1999. 1 page.
46.	U.S. Department of Commerce, Economics and Statistics Administration. *1990 Census of Population, General Population Characteristics Texas, Section 2 of 2.* June 1992. 4 pages.

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47.	Laing, Malcolm, Texas Natural Resources Conservation Commission. Public *Water Supply Regulatory Program, Water System Data.* December 21, 1998. 8 pages.
48.	Rumbaugh, Kenneth, City of Levelland. Facsimile to Allan Seils containing Summary of Water Use - Calendar Year 1998 and Water Well and CRMWA Monthly Combined Consumption. June 30, 1999. 14 pages.
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50.	USEPA. Not Dated. Version OLC02.0. Target Compound List and Contract Required Quantitation Limits. Total Pages: 6.
51.	Agency for Toxic Substances and Disease Registry (ATSDR). 1992. Toxicological profile for vanadium (excerpt). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service. 67 pages.

WORKSHEET FOR COMPUTING HRS SITE SCORE

		S	S^2
1.	Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	84.81	7,193
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	NS	
2b.	Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	NS	
2c.	Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	NS	
3.	Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	NS	
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	NS	
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$	7,193	
6.	**HRS Site Score** Divide the value on line 5 by 4 and take the square root.	**42.41**	

TABLE 3-1
GROUND WATER MIGRATION PATHWAY SCORESHEET

Factor Categories and Factors			Maximum Value	Value Assigned	
Likelihood of Release to an Aquifer					
1.	Observed Release		550	550	
2.	Potential to Release			NA	
	2a.	Containment	10	NA	
	2b.	Net Precipitation	10	NA	
	2c.	Depth to Aquifer	5	NA	
	2d.	Travel Time	35	NA	
	2e.	Potential to Release (Lines 2a(2b + 2c + 2d))	500	NA	
3.	Likelihood of Release (Higher of Line 1 and 2e)		550		550
Waste **Characteristics**					
4.	Toxicity/Mobility		*	100	
5.	Hazardous Waste Quantity		*	100	
6.	Waste Characteristics		100		10
Targets					
7.	Nearest Well		50	50	
8.	Population:				
	8a.	Level I Concentrations	**	300	
	8b.	Level II Concentrations	**	855	
	8c.	Potential Contamination	**	62.1	
	8d.	Population (Lines 8a + 8b + 8c)	**	1,217.1	
9.	Resources		5	5	
10.	Wellhead Protection Area		20	0	
11.	Targets (Lines 7 + 8d + 9 + 10)		**		1,272.1
Ground Water Migration Score for an Aquifer					
12.	Aquifer Score ((Lines 3 x 6 x 11)/82,500)***		100		84.81
Ground Water Migration Pathway Score					
13.	Pathway Score (S_{gw}), (Highest value from Line 12 for all aquifers evaluated)***		100		84.81

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

2.2.1 Source Identification

Number of the source: 1

Name and description of the source: Ground Water Plume (other)

The source is a ground water plume primarily containing 1,2-dichloroethane (DCA), vanadium and several other contaminants which extends from west to east (the hydrological ground water gradient) along West State Highway 114 for approximately 1 ½ miles from the former Motor Fuels Corporation (MFC) property to the City of Levelland Municipal Park, Levelland, Texas (See Figure 2). The ground water plume is approximately one mile wide (See Figure 2). The ground water plume size is based upon analysis of ground water samples collected from area residential, business and public supply wells. A total of 28 ground water wells have been found to be impacted by 1,2-DCA and/or vanadium contamination to date: 19 residential wells, 5 business wells, 3 City of Levelland public supply wells (one is closed), and one irrigation well (Ref. 3, pp. 13-27; Ref. 4, pp. 19-26; Ref. 13, pp. 1-49; Ref. 15, pp. 1-20; and Ref. 18, pp. 1-24).. A number of City of Levelland public supply water wells are in the immediate path of the ground water plume (See Figures 4 and 5).

The source of the 1,2-DCA and vanadium contamination is unknown and the area of contamination remains widely undefined. Previous investigations have suggested several potential source areas including primarily the former Motor Fuels Corporation (MFC) property (Ref. 3, pp. 16-19, Ref. 4, pp. 10-19, Ref. 5, pp. 24, Ref. 6, p. 1, Ref. 7, p. 1, Ref. 8, p. 1, Ref. 9, pp. 1-13, Ref. 10, p. 1 and pp. 13-39), and several oil field service facilities (Ref. 10, pp. 1-12, Ref. 11, pp. 1-11, Ref. 13, p. 29).

However, adequate documentation attributing the hazardous substances to one or more of the potential source areas has not been identified according to the HRS criteria. Therefore, a ground water plume with no identified source was used for HRS scoring. The ground water plume with no identified source was characterized as the site source based on the following:

- The plume, although undefined, was established solely by sampling, using the criteria for an observed release to the Ground Water Migration Pathway (see Table 1).

- The level of effort to identify the original source(s) of the hazardous substances was a "Screening Site Inspection" (SSI) Report dated October 1996 (Ref. 3, pp. 1-394); an "Expanded Site Inspection" (ESI) Report dated September 1997 (Ref. 4, pp. 1-395); and additional addendum sampling events to the ESI on August 18-20, 1998 (Ref. 13, pp. 1-49, and Ref. 14, pp. 1-129), November 10, 1998 (Ref. 15, pp. 1-20, Ref. 16, pp. 1-46, and Ref. 17, pp.1-21), and December 8-9, 1998 (Ref. 18, pp. 1-24, Ref. 19, pp. 1-64, and Ref. 20, pp. 1-22).

The investigations at the site, tasked by the U.S. Environmental Protection Agency (USEPA), documented 1,2-DCA concentrations ranging as high as 182 µg/L (Ref.22, p. 35). This concentration greatly exceeds the USEPA maximum contaminant level (MCL) of 5 µg/L for 1,2-DCA in drinking water (Ref. 2, SCDM). Also, vanadium was found at levels as high as 490 µg/L (Ref. 14, p. 41). Other contaminants found in wells within the ground water plume included 1,2-dichloropropane, benzene, ethyl benzene, *para*-and/or *meta*-xylene, phenol, antimony, arsenic, barium, beryllium, copper, lead, manganese, mercury, nickel selenium and zinc, plus a number of tentatively identified compounds (Ref. 14, pp. 1-129, Ref. 16, pp. 1-46, Ref. 17, pp. 1-21, Ref. 19, pp. 1-64, Ref. 20, pp. 1-22, Ref. 21, pp. 1-76; and Ref. 22, pp. 1-71). While potential sources were investigated during the SSI and ESI, no source(s) were identified that could be definitively attributed to the hazardous substances found in the State Road 114 Ground Water Plume (Ref. 3, 1-394, and Ref. 4, pp. 1-395).

The CERCLA hazardous substance and pollutant or contaminant associated with the source, used to establish an observed release to the Ground Water Migration Pathway are 1,2-DCA and vanadium, respectively.

Location of the source, with reference to a map of the site: (see Figure 2, Site Map)

The State Road 114 Ground Water Plume is located west of the City of Levelland, Hockley County, Texas. The ground water plume is bounded by the former Motor Fuels Corporation property on the west, Ellis Road to the north, Houston Avenue to the South and the City of Levelland Municipal Park to the East. Since this source is a ground water plume (with no identified source), the center of the plume is used to locate the geographic location of the contamination (Ref. 1, p. 51595).

Source type for HRS evaluation purposes: Other

This source type "other" is used when defined source types do not apply. This source consists of a ground water plume with no identified source and is therefore classified and evaluated as the HRS source type other (Ref. 1, p. 51587).

Containment

Gas release to air: The air migration pathway was not evaluated; therefore, gas containment was not evaluated.

Particulate release to air: The air migration pathway was not evaluated; therefore, particulate containment was not evaluated.

Release to ground water: On October 24, 1995, March 11, 1997, August 18-20, 1998, November 10, 1998, and December 8-9, 1998, the TNRCC collected ground water samples from several wells documenting levels of 1,2-DCA from 2.0 µg/L to 182 µg/L and vanadium from 30.1 µg/L to 490 µg/L (Ref. 14, pp.1-129; Ref. 16, pp. 1-46; Ref. 17, pp. 1-21; Ref. 19, pp. 1-64; Ref. 20, pp. 1-22; Ref. 21, pp. 1-76; and Ref. 22, pp. 1-71). A containment factor value of 10 is assigned to the source as specified in Table 3-2 of the HRS Rule (Ref. 1, p. 51595).

Release via overland migration and/or flood: The surface water migration pathway was not evaluated; therefore, surface water containment was not evaluated.

2.2.2 Hazardous Substances Associated With A Source

The ground water plume source contains a "hazardous substance" and "pollutant or contaminant" for which an observed release was established within the Ogallala Aquifer, the aquifer being evaluated for the Ground Water Migration Pathway. The hazardous substance and pollutant or contaminant listed below in Table 1 were detected in samples collected by the TNRCC in 1995, 1997 and 1998, and during the SSI and ESI sampling events tasked to the TNRCC by the USEPA (Ref. 14, pp.1-129; Ref. 16, pp. 1-46; Ref. 17, pp. 1-21; Ref. 19, pp. 1-64; Ref. 20, pp. 1-22; Ref. 21, pp. 1-76; and Ref. 22, pp. 1-71).

Sixteen (16) water wells were found to contain concentrations of 1,2-DCA (See Table 1). 1,2-DCA is a hazardous substance under Section 102 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). It is a clear, thick man-made liquid that is not found naturally in the environment (Ref.23, p. 1).

Vanadium has been identified as a "pollutant or contaminant" under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), § 101(14) and § 101(33). The term "pollutant or contaminant" includes, but is not limited to, any element, substance, compound or mixture, including disease-causing agents, which after release in the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, will likely cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including reproductive), or physical deformations in such organisms or their offspring (Ref.24, p.1).

Vanadium is a compound that occurs in nature (Ref.25, p.2). An observed release was established for vanadium in twenty seven (27) water wells within the ground water plume source (See Table 1). Vanadium was documented at concentrations ranging from 30 ug/L to 54 ug/L ((Ref. 14, pp. 1-129; Ref. 17, pp. 1-21; Ref. 20, pp. 1-22; and Ref. 22, pp. 1-71). A concentration of vanadium at 490 ug/L in a sample (GW-11/8FAXBW02-07 [08/19/98]) collected at 335 N State Road 1490 (Ref. 14, pp. 41). This concentration exceeds numeric removal action level of 250 ug/L for contaminated drinking water sites utilized by the USEPA (Ref. 26, pp. 15). Also, this concentration exceeds screening levels developed by the Texas Department of Health in consultation with the Agency for Toxic Substances and Disease Registry (ATSDR) based on ATSDR's intermediate-duration oral minimal risk level (MRL) for vanadium of 0.003 mg/kg-day (Ref. 28, p. 5). ATSDR established this MRL based on animal studies documenting histological changes in kidneys, lungs, and spleen, and supporting studies that report adverse developmental effects, cardiovascular effects, and gastrointestinal effects resulting from exposure to vanadium (Ref. 51, p. 28). The Texas Department of Health derived a screening value for children of 45 to 50 ug vanadium/L based on the 0.003 mg/kg-day MRL and standard drinking water exposure assumptions (Ref. 28, pp. 5-7). The concentrations of vanadium documented in the residential well water at this site poses a public health hazard because evidence exists that exposures have occurred, are occurring, and are likely to occur in the future; and, that intermediate- or chronic-duration exposure to vanadium at the concentrations found in water from some of the wells could result in noncarcinogenic toxic effect (Ref. 28, p. 7).

SOURCE NO. 1 - GROUND WATER PLUME (WITH NO IDENTIFIED SOURCE)
SOURCE HAZARDOUS SUBSTANCES

TABLE 1

HAZARDOUS SUBSTANCE	Evidence	
	Sample Designation/ ID Number [Date]/ Location	Reference: Page(s)
1,2- dichloroethane	GW-9/6FADW02-09 [10/24/95] 1414 Evening Tower Road	Ref. 3, pp. 39-45; Ref. 21, pp. 61, 69, and 76; Ref. 31, p. 5
	GW-06/7FAXDW13-06 [03/11/97] City Well #18	Ref. 4, pp. 25; Ref. 22, pp. 35, 66, and 68; Ref. 31, p. 5
	GW-07/7FAXDW13-07 [03/11/97] 2512 W. State Road 114	Ref. 4, pp. 25; Ref. 22, pp. 42, 66, and 68; Ref. 31, p. 5
	GW-06/8FAXBW02-01 [08/19/98] 213 N State Road 1490	Ref. 14, pp. 6 and 127; Ref. 31, p. 5
	GW-02/8FAXBW02-13 [08/18/98] 214 N State Road 1490	Ref. 14, pp. 75 and 126; Ref. 31, p. 5
	GW-04/8FAXBW02-15 [08/18/98] 218 N State Road 1490	Ref. 14, pp. 87 and 126; Ref. 31, p. 5
	GW-05/8FAXBW02-16 [08/19/98] 215 N State Road 1490	Ref. 14, pp. 93 and 126; Ref. 31, p. 5
	GW-07/8FAXBW02-03 [08/19/98] 210 N State Road 1490	Ref. 14, pp. 18 and 127; Ref. 31, p. 5
	GW-09/8FAXBW02-04 [08/19/98] 210 N State Road 1490 (Irrigation)	Ref. 14, pp. 24 and 127; Ref. 31, p. 5
	GW-10/8FAXBW02-06 [08/19/98] 311 N State Road 1490	Ref. 14, pp. 33 and 127; Ref. 31, p. 5
	GW-11/8FAXBW02-07 [08/19/98] 335 N State Road 1490	Ref. 14, pp. 39 and 127; Ref. 31, p. 5
	GW-15/8FAXBW-02-19 [08/20/98] 1848 W State Road 114	Ref. 14, pp. 108 and 128; Ref. 31, p. 5
	GW-18/8FAXBW02-21 [08/20/98] 1862 W State Road 114	Ref. 14, pp. 120 and 128; Ref. 31, p. 5

SOURCE NO. 1 - GROUND WATER PLUME (WITH NO IDENTIFIED SOURCE)
SOURCE HAZARDOUS SUBSTANCES

TABLE 1 - Continued

HAZARDOUS SUBSTANCE	Evidence	
	Sample Designation/ ID Number [Date]/ Location	Reference: Page(s)
1,2- dichloroethane	GW-21/8FAXBW02-11 [08/19/98] 475 N State Road 1490	Ref. 14, pp. 63, 127 and 129; Ref. 31, p. 5
	GW-22/FDG41/MFGR54 [11/10/98] 2412 McHamm Road	Ref. 16, pp. 3-8, and 16; Ref. 17, pp. 3-8, 14, and 19; Ref. 31, pp. 1-2
	GW-31/FFS50/MFHM77 [11/10/98] 480 N State Road 1490	Ref. 16, pp. 3-8, and 16; Ref. 17, pp. 3-7, 9, 14, and 21; Ref. 31, pp. 1-2
Vanadium	GW-08/7FAXDW13-01 [03/11/97] Edwards Transport, Inc.	Ref. 4, pp. 32-36; Ref. 22, pp. 7 and 71; Ref. 31, p. 5
	GW-09/7FAXDW13-02 [03/11/97] T&B Services, Inc.	Ref. 4, pp. 32-36; Ref. 22, pp. 13 and 71; Ref. 31, p. 5
	GW-02/7FAXDW-13-03 [03/11/97] 3058 W Houston	Ref. 4, pp.32-36; Ref. 22, pp. 18, 67 and 69; Ref. 31, p. 5
	GW-10/7FAXDW13-04 [03/1197] 1414 Evening Tower Road	Ref. 4, pp. 32-36; Ref. 22, pp. 24 and 69; Ref. 31, p. 5
	GW-07/7FAXDW13-07 [03/11/97] 2512 W State Road 114	Ref. 4, pp. 32-36; Ref. 22, pp. 45, 66 and 68; Ref. 31, p. 5
	GW-03/7FAXDW13-08 [03/11/97] City Well #15	Ref. 4, pp. 32-36; Ref. 22, pp. 50 and 70; Ref. 31, p. 5
	GW-01/8FAXBW02-12 [08/18/98] City Well #21	Ref. 14, pp. 71 and 126; Ref. 31, p. 5
	GW-02/8FAXBW02-13 [08/18/98] 214 N State Road 1490	Ref. 14, pp. 77 and 126; Ref. 31, p. 5
	GW-04/8FAXBW02-15 [08/18/98] 218 N State Road 1490	Ref. 14, pp. 89 and 126; Ref. 31, p. 5
	GW-05/8FAXBW02-16 [08/19/98] 215 N State Road 1490	Ref. 14, pp. 95 and 126; Ref. 31, p. 5

SOURCE NO. 1 - GROUND WATER PLUME (WITH NO IDENTIFIED SOURCE)
SOURCE HAZARDOUS SUBSTANCES

TABLE 1 - Continued

HAZARDOUS SUBSTANCE	Evidence	
	Sample Designation/ ID Number [Date]/ Location	Reference: Page(s)
Vanadium	GW-06/8FAXBW02-01 [08/19/98] 213 N State Road 1490	Ref. 14, pp. 8 and 127; Ref. 31, p. 5
	GW-07/8FAXBW02-03 [08/19/98] 210 N State Road 1490	Ref. 14, pp. 20 and 127; Ref. 31, p.5
	GW-09/8FAXBW02-04 [08/19/98] 210 N State Road 1490 (Irrigation)	Ref. 14, pp. 26 and 127; Ref. 31, p. 5
	GW-10/8FAXBW02-06 [08/19/98] 311 N State Road 1490	Ref. 14, pp. 35 and 127; Ref. 31, p. 5
	GW-11/8FAXBW02-07 [08/19/98] 335 N State Road 1490	Ref. 14, pp. 41 and 127; Ref. 31, p. 5
	GW-12/8FAXBW02-08 [08/19/98] 1481 McHamm Road	Ref. 14, pp. 47 and 127; Ref. 31, p. 5
	GW-13/8FAXBW02-09 [08/19/98] 2312 McHamm Road	Ref. 14, pp. 53 and 127; Ref. 31, p. 5
	GW-14/8FAXBW02-10 [08/19/98] 143 N State Road 1490	Ref. 14, pp. 59 and 127; Ref. 31, p. 5
	GW-15/8FAXBW02-19 [08/20/98] 1848 W State Road 114	Ref. 14, pp. 110 and 128; Ref. 31, p. 5
	GW-17/8FAXBW02-20 [08/20/98] 149 N State Road 1490	Ref. 14, pp. 116 and 128; Ref. 31, p. 5
	GW-21/8FAXBW02-11 [08/19/98] 475 N State Road 1490	Ref. 14, pp. 65, 127 and 129; Ref. 31, p. 5
	GW-24/FFX37/MFGR50 [11/10/98] City Well #15	Ref. 17, pp. 3-8, and 16; Ref. 31, pp. 1-2
	GW-22/FDG41/MFGR54 [11/10/98] 2412 McHamm Road	Ref. 17, pp. 3-8, and 19; Ref. 31, pp 1-2

SOURCE NO. 1 - GROUND WATER PLUME (WITH NO IDENTIFIED SOURCE)
SOURCE HAZARDOUS SUBSTANCES

TABLE 1 - Continued

HAZARDOUS SUBSTANCE	Evidence	
	Sample Designation/ ID Number [Date]/ Location	Reference: Page(s)
Vanadium	GW-31/FFS50/MFHM77 [11/10/98] 480 N State Road 1490	Ref. 17, pp. 3-7, 14 and 21; Ref. 31, pp. 1-2
	GW-40/FFX40/MFJE14 [12/08/98] 512 N State Road 1490	Ref. 20, pp. 3-8, and 16; Ref. 31, pp. 3-4
	GW-44/FFX44/MFJE18 [12/08/98] 204 Avenue V	Ref. 20, pp. 3-7, 12 and 20; Ref. 31, pp. 1-2
	GW-45/FFX45/MFJE19 [12/08/98] 402 Avenue X	Ref. 20, pp. 3-7, 12 and 21; Ref. 31, pp. 1-2

2.2.2 Hazardous Substances Associated With A Source - (Continued)

For the purposes of this HRS Documentation Record, three wells have been designated as the background sample locations for this HRS Documentation Record. Two of the wells, GW-01/6TFADW02-01 (Ref. 3, pp. 51, 63 and 72) and GW-03/6TFADW-02-03 (Ref. 3, pp. 51, 63 and 74), were selected from the October 1995 SSI sampling event and GW-01/7FAXDW13-10 (Ref. 4, pp. 45 and 61) from the March 1997 ESI sampling event. Both sampling events were tasked by the USEPA. All three wells were designated background sample locations because they are up gradient from the State Road 114 Ground Water Plume; screened at similar depths; and from the same aquifer (Ogallala Aquifer) as all of the contaminated source wells (Figure 4; Ref. 30, pp. 1-5; p. 6; and pp. 26-34). Wells GW-01/6TFADW02-01 (Amoco), GW-03/6TFADW-02-03 (Earl May), and GW-01/7FAXDW13-10 (3100 West Ellis) are located at approximately 1.19, 0.96, and 1.1 miles respectfully to the northwest. The background sample results for Wells No.GW-01/6TFADW02-01, GW-03/6TFADW-02-03 and GW-01/7FAXDW13-10 are shown in Table 2 below.

A summary of the highest constituent concentrations detected in the background ground water samples collected from the Ogallala Aquifer are presented in Table 2. The locations of the background ground water samples are depicted in Figure 4. For further information on background samples and the data usability assessment refer to Reference 31, pp. 6-8.

2.2.2 Hazardous Substances Associated With A Source - (Continued)

SOURCE NO. 1 - BACKGROUND
SOURCE HAZARDOUS SUBSTANCES

TABLE 2

Inorganic Constituents Detected in Background Groundwater Samples				
Constituent (µg/l)	**Station/ Laboratory Number/ Location [Date]**	**Highest Concentration (SQL) (µg/L)**	**3 x Highest Background Concentration (µg/L)**	**Reference**
1,2-DCA	GW-01/6TFADW02-01 Amoco [10/24/95] GW-03/6TFADW-02-03 Earl May Residence [10/24/95] GW-01/7FAXDW13-10 3100 West Ellis [03/11/97]	ND [2]	N/A	Ref. 21, pp. 5, 19, 72 and 76 Ref. 22, pp. 60, 67 and 68
Vanadium	GW-01/6TFADW02-01 Amoco [10/24/95] GW-03/6TFADW-02-03 Earl May Residence [10/24/95] GW-01/7FAXDW13-10 3100 West Ellis [03/11/97]	ND [30]	N/A	Ref. 21, pp. 8, 22, 72 and 76 Ref. 22, pp. 62, 67 and 68

Notes: (SQL) = Sample quantitation limit is presented in brackets for convenience.
ND = Not Detected. Concentrations for these constituents were not detected at the reported quantitation limit.
N/A = Not Applicable

2.2.2 Hazardous Substances Associated With A Source - (Continued)

All samples were collected according to the EPA approved state Quality Assurance Project Plan and sample locations were approved by EPA prior to sample collection (Ref. 32, pp.1-66; Ref. 33, pp. 1-65; and Ref. 34, pp. 1-66).

2.2.3 Hazardous Substances Available to a Pathway

An observed release to the Ground Water Migration Pathway, Source 1 (Ground Water Plume with no identified source), was based on chemical analyses of ground water samples from the aquifer of concern

that indicate concentrations of hazardous substances are present at three times greater than the designated background levels and in concentrations greater than the corresponding SQLs. Hazardous substances associated with Source 1 that have been found at levels that meet the criteria for observed release include 1,2-DCA and vanadium (Ref. 1, p. 51595).

2.3 LIKELIHOOD OF RELEASE

Refer to Section 3.1.1 of this documentation record for specific information related to ground water samples that meet the criteria for observed release.

2.4 WASTE CHARACTERISTICS

Specific factors related to waste characteristics associated with Source 1, Ground Water Plume (with no identified source), are presented below.

2.4.1 Selection of Substance Potentially Posing Greatest Threat

1,2-DCA and vanadium were selected as the hazardous substances potentially posing the greatest hazard for the ground water migration pathway. These substances have been found meeting the observed release criteria for the ground water migration pathway.

2.4.2. Hazardous Waste Quantity

2.4.2.1 Source Hazardous Waste Quantity

2.4.2.1.1. Hazardous Constituent Quantity (Tier A) - Not Evaluated (NE)

The information available is not sufficient to evaluate Tier A, as required in Section 2.4.2.1.1 of the HRS Rule. As a result, the evaluation of Hazardous Waste Quantity proceeds to the evaluation of Tier B, hazardous wastestream quantity (Ref. 1, p. 51591).

2.4.2.1.2. Hazardous Wastestream Quantity (Tier B) - NE

The information available is not sufficient to evaluate Tier B, as required in Section 2.4.2.1.2 of the HRS Rule. As a result the evaluation of Hazardous Waste Quantity proceeds to the evaluation of Tier C, volume (Ref. 1, p. 51591).

2.4.2.1.3. Volume (Tier C) - NE

The information available is not sufficient to evaluate Tier C, as required in Section 2.4.2.1.3 of the HRS Rule. Although the source volume was not adequately determined and its extent is unknown, the value is greater than 0 (Ref. 1, p. 51591).

2.4.2.1.4. Area (Tier D) - NE

2.4.2.1.5. Source Hazardous Waste Quantity Value

As described in the HRS Rule, the highest value assigned to a source from among the four tiers of hazardous constituent quantity (Tier A), hazardous wastestream quantity (Tier B), volume (Tier C) shall be selected as the source hazardous waste quantity value (Ref. 1, pp. 51590 and 51591).

SOURCE NO. 1 - GROUND WATER PLUME (WITH NO IDENTIFIED SOURCE) SOURCE HAZARDOUS WASTE QUANTITY

TABLE 3

Tier Measure	Migration Pathway (Ground Water)
Tier A, Constituent Quantity	NE
Tier B, Wastestream Quantity	NE
Tier C, Volume	Unknown, but >0*
Tier D, Area	NE

* The total volume of the ground water plume (with no identified source) cannot be adequately determined since only existing water wells are the only locations where 1,2-DCA and vanadium have been documented to date. Therefore, the volume of the ground water plume will be assigned a volume hazardous waste quantity value of greater than (>) 0. The value of >0 reflects that the volume is known to be greater than 0, but the exact amount is unknown.

Source Hazardous Waste Quantity Value: >0

SITE SUMMARY OF SOURCE DESCRIPTIONS

Table 4

Source Number	Source Hazardous Waste Quantity Value	Containment			
		Ground Water	Surface Water	Gas	Air Particulate
1	Unknown, but >0	10	Not Evaluated	Not Evaluated	Not Evaluated

According to Section 2.4.2.2. of the HRS Rule, a hazardous waste quantity factor value of 100 was assigned to the ground water plume because hazardous constituent quantity data is incomplete, and targets for the Ground Water Migration Pathway are subject to Level I and Level II concentrations (Ref. 1, pp. 51591 and 51592).

Source Hazardous Waste Quantity Value: >0

Hazardous Waste Quantity Factor Value: 100

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 GENERAL CONSIDERATIONS

Stratum 1

Stratum Name: Amarillo and Randall Series Soils

Description: The Amarillo fine sandy loam (AfA), 0 to 1 percent slope, comprises 36% of the surface soils in Hockley County (Ref. 35, p. 9). The Amarillo series generally consists of deep, moderately sandy, reddish-brown loamy soils. The upper soils, 0" to 10" thick, consist of reddish brown to dark brown sandy loams ranging in textures from coarse granular to fine sand. Underlying the upper soils is a layer of yellowish-red sandy weakly calcareous clayey loam of coarse prismatic structure averaging 44 inches thick. Below these subsoils is a layer of pink sandy clay loam (typically 30 to 56 inches thick) which contains accumulations of calcium carbonate (Ref. 35, pp. 8-9). The Amarillo soils are generally well drained, moderately permeable, have excellent water-holding capacity, and are moderately fertile (Ref. 35, p. 8). These soils, however, are easily susceptible to wind and water erosion. Agricultural use is extensive throughout Hockley County in these rich soils using well water for irrigation (Ref. 35, pp.9, 12, and 17).

The Randall Series clays are predominantly found in the intermittent shallow playa basins that occur throughout Hockley County, which comprises 1.6 % of the surface soils. These water-laid deposits of dark-gray, poorly drained clays are developed from unconsolidated, fine-textured, late-Pleistocene sediments. Textures typically range from fine clays to fine sandy loams at depths from 0" to 45" (Ref. 35, pp.11, 13-14, and 17).

Aquifer/Stratum 2

Aquifer/Stratum Name: Quaternary Sediments

Description: Underlying the primarily Amarillo loam surface soils are the Quaternary (Pleistocene Series) Tahoka, Tule, and Blanco Formations consisting of non-water bearing, wind-deposited clays, sands, and limestones that filled deflation basins in the Cenozoic Era. These depositions range from several inches to 150 feet thick composed of stratified layers of sands, clays, diatomaceous earths, betonitic clays, conglomerates, caliche, and freshwater limestones. Deposits of the Blanco and Tule Formations are very similar in character and the Blanco Formation is unconformable to both the underlying Bridwell and overlying Tule Formations. Although these deposits are hydrologically continuous with the lower Ogallala Group, they generally yield only small quantities of ground water from old stream channels. These rocks can be seen exposed in some of the playa basins and stream terraces as lake deposits (Ref. 5, pp. 14-17).

Aquifer/Stratum 3

Aquifer/Stratum Name: Ogallala Aquifer/Tertiary Ogallala Formation

Description: Beneath these formations lie the Tertiary (Pliocene Series) rocks of the Ogallala Group comprised of the Bridwell and Couch Formations. These rocks consist of clays, silts, sands, and gravel erosional deposits transported from the eastern ranges of the Rocky Mountains in early Cenozoic Era. Thickness of these rocks ranges from 50 to 400 feet depending on the beveled substructure of the underlying Cretaceous and Triassic rocks. The Bridwell Formation is characterized by reddish-brown and gray unconsolidated sands and clays with a secondary calcium carbonate layer that has formed a caliche caprock. The Couch Formation is composed primarily of pinkish-gray, calcareous sands and basal gravel. Water supplies in the Ogallala Group are abundant and have become the principal water source of the Southern High Plains (Ref. 5, pp. 13-17).

The major hydrologic unit containing potable water at the site is the Ogallala Aquifer ranging in thicknesss from 50 to 300 feet (Ref. 49, p. 14). Water in the aquifer is contained within pore spaces of unconsolidated or partly consolidated sediments comprising the Birdwell and Couch Formations. Recharge into the Ogallala aquifer can take place through diffusive infiltration directly into Ogallala outcrops and through Quaternary deposits that overlie the Ogallala in large areas (Ref. 49, p. 24). The aquifer is naturally recharged by direct precipitation and surface runoff that infiltrate the numerous sand dunes and playa basins found throughout the Southern High Plains region (Ref. 5, pp. 13-14; Ref. 36, pp. 6-7 and 23-24; Ref. 49, p. 24). It is assumed that the most likely method of ground-water recharge is focused percolation of partly evaporated plays-lake water (Ref. 49, p.5).

Ground water from the Ogallala Aquifer is used extensively for domestic, industrial, an d agricultural purposes throughout Hockley County, but is being rapidly depleted by overpumpage for irrigation (Ref. 36, p. 6). Water quality ranges from excellent to slightly saline, decreasing in quality progressing south. Total dissolved solids (TDS) range from less than 500 parts per million (PPM) in the Palo Duro region to more than 3,000 ppm in the Midland area. High chlorides and sulfates associated with Cretaceous rock outcrops are commonly found in the alkali lake basins located throughout Hockley and adjacent counties (Ref. 36, pp. 6-7 and 24).

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

Aquifer Being Evaluated: Ogallala Aquifer

The Ogallala Aquifer is the aquifer being evaluated. This aquifer is the principal source of private drinking water in Hockley County and provides approximately 21.5% of the City of Levelland's drinking water (Ref. 40, p. 1).

Chemical Analysis:

The samples referenced in Table 6 were collected from numerous business, private domestic and public supply water wells. These wells were found to be contaminated with 1,2-DCA and vanadium. 1,2-DCA (11 µg/L) contamination was originally documented in a water well sample collected by the Texas Department of Health (TDH) at the Farmers Co-Op Elevator Association water well (Ref. 30, p. 13). 1,2-DCA contamination was found again in the Farmer Co-Op Elevator Association water well by the TWC on April 17, 1991 (Ref. 9, p. 5). A Screening Site Inspection (SSI) conducted in October 1995 documented concentrations of 1,2-DCA in the Farmers Co-Op Elevator Association water well of 32.2 µg/L and in the City of Levelland Well #18 at 16.2 µg/L (Ref.21, pp. 54 and 12, respectively). During the most recent sampling at the site, the Expanded Site Inspection (ESI) conducted in March of 1997 and follow up sampling events of August 1998, November 1998, and December 1998., 1,2-DCA concentrations were documented in several private domestic and business water wells ranging from 2.0 µg/L to 182 µg/L. A majority of the concentrations documented exceed the MCL of 5 µg/L for 1,2-DCA in drinking water. In addition, Vanadium was found at levels ranging from 30.1 µg/L to 490 µg/L (Ref. 14, pp. 1-129; Ref. 16, pp. 1-46; Ref. 17, pp. 1-21; Ref. 19, pp. 1-64; Ref. 20, pp. 1-22; and Ref. 22, pp. 1-71). The U.S. EPA Superfund Removal Action Level for Vanadium is 250 µg/L (Ref. 26, p. 15) and the TNRCC Standard No. 2 Risk Reduction Rule for residential ground water is 260 µg/L (Ref. 27, p. pp. 92 and 100).

The source of the 1,2-DCA and Vanadium contamination is unknown and the area of contamination remains undefined. Previous investigations have suggested potential sources for the contamination, however, they have identified no single source (Ref. 3, pp. 16-19.; Ref. 4, pp. 10-19; Ref. 5, pp. 24; Ref. 9, pp. 1-13; Ref. 10, 1-39 and Ref. 11, pp. 1-11).

Background Samples:

For the purposes of this HRS Documentation Record, three wells have been designated as the background sample locations for this HRS Documentation Record. Two of the wells, GW-01/6TFADW02-01 and GW-03/6TFADW02-03, were selected from the October 1995 SSI sampling event and GW-01/7FAXDW13-10 from the March 1997 ESI sampling event. Both sampling events were tasked by the USEPA. All three wells were designated background sample locations because they are up gradient from the State Road 114 Ground Water Plume; screened at similar depths; and from the same aquifer (Ogallala Aquifer) as all of the contaminated source wells. Wells GW-01/6TFADW02-01 (AMOCO), GW-03/6TFADW02-03 (Earl May) and GW-01/7FAXDW13-10 (3100 West Ellis) are located to the northwest (Ref. 3, p. 25; Ref. 4, p.11) of the site. The background sample results for Wells No.GW-01/6TFADW02-01, GW-03/6TFADW02-03 and GW-01/7FAXDW13-10 are shown in Table 2 below.

A summary of the highest constituent concentrations detected in the background ground water samples collected from the Ogallala Aquifer are presented in Table 2. These samples demonstrate that both vanadium and 1,2-DCA are neither naturally occurring at detectable levels and are not ubiquitous in the Ogallala aquifer in the site vicinity. The locations of the background ground water samples are depicted in Figure 4. For further information on background samples and the data usability assessment refer to Reference 31.

BACKGROUND
GROUND WATER SAMPLE LOCATIONS

Table 5

Sample Designation/ ID Number [Date]	Hazardous Substance	Concentration (ug/L)	Screened Interval (feet)	SQL (or equivalent)* (ug/L)	Reference: Page(s)
GW-01/6TFADW02-01 [10/24/95]	1,2-DCA	ND	NA-180'	2.0	Ref. 3, pp. 51, 63 and 72 Ref. 21, pp. 5, 8 and 76 Ref. 30, pp. 26-34
(See Amoco, Figure 4)	Vanadium	ND		30.0	
GW-03/6TFADW02-03 [10/24/95]	1,2-DCA	ND	NA- 210'	2.0	Ref. 3, pp. 51, 63 and 74 Ref. 21, pp. 19, 22, 72 and 76 Ref. 30, p. 6
(See Earl May, Figure 4)	Vanadium	ND		30.0	
GW-01/7FAXDW13-10 [03/11/97]	1,2-DCA	ND	199'-207'	2.0	Ref. 4, pp. 45 and 61 Ref. 22, pp. 60, 62, 67 and 68 Ref. 30, pp. 1-2
(See 3100 West Ellis, Figure 4)	Vanadium	ND		30.0	

ND = Not Detected. Concentrations for these constituents were not detected at the reported quantitation limit.
NA = Not Available. See Reference 45.

All samples were collected according to the EPA approved state Quality Assurance Project Plan and sample locations were approved by EPA prior to sample collection (Ref. 32, pp.1-66; Ref. 33, pp. 1-65; and Ref. 34, pp. 1-66).

Contaminated Samples:

The following ground water wells listed in Tables 6 and 7 have been documented to be contaminated with a hazardous substance and/or a pollutant or contaminant associated with the ground water plume with no identified source. The well locations can be seen in Figures 3, 4 and 5.

CONTAMINATED GROUNDWATER WELLS

Table 6

Well Sample ID/ Location	Date	Screened Int.(ft.)	Reference: Page(s)
GW-09/6FADW02-09 1414 Evening Tower Road	10/24/95	NA-185	Ref. 3, pp. 55 and 79-80 Ref. 21, pp. 61, 64, 69 and 76 Ref. 30, 7-15
GW02/6TFADW02-02 City Well #18	10/24/95	NA	Ref. 3, pp. 52, and 73 Ref. 21, pp. 12, 15, 71 and 76
GW-08/7FAXDW13-01 Edwards Transport, Inc.	03/11/97	NA	Ref. 4, pp. 48, 54 and 68 Ref. 22, pp. 5, 7 and 71 Ref. 30, pp. 16-17
GW-02/7FAXDW13-03 3058 W. Houston	03/11/97	132' - 182'	Ref. 4, pp. 46, 54 and 62 Ref. 22, pp. 16, 18, 67 and 69 Ref. 30, pp. 18-22
GW-10/7FAXDW13-04 1414 Evening Tower Road	03/11/97	NA - 185'	Ref. 4, pp. 47, 53 and 70 Ref. 22, pp. 22, 24 and 69 Ref. 30, pp. 7-15
GW-06/7FAXDW13-06 City Well #18	03/11/97	NA	Ref. 4, pp. 43-44, 53 and 66 Ref. 22, pp. 35, 38, 66 and 68
GW-07/7FAXDW13-07 2512 W State Road 114	03/11/97	180' - 240'	Ref. 4, pp. 44, 54 and 67 Ref. 22, pp. 42, 45, 66 and 68 Ref. 30, pp. 23-25
GW-03/7FAXDW13-08 City Well #15	03/11/97	120' - 220'	Ref. 4, pp. 47 and 63 Ref. 22, pp. 48, 50 and 70 Ref. 30, pp. 82-89
GW-09/7FAXDW13-02 T&B Services, Inc.	03/11/97	NA	Ref. 4, pp. 49, 53 and 69 Ref. 22, pp. 11, 13 and 71
GW-01/8FAXBW02-12 City Well #21	08/18/98	130' - 230'	Ref. 13, pp. 5-6 and 34 Ref. 14, pp. 69, 71 and 126 Ref. 30, pp. 100-110 Ref. 31, p. 5
GW-02/8FAXBW02-13 214 N. State Road 1490	08/18/98	NA	Ref. 13, pp. 7-8 and 35 Ref. 14, pp. 75, 77 and 126 Ref. 30, pp. 35-38 Ref. 31, p. 5

NA = Not Available. See Reference 45.

Contaminated Samples:

CONTAMINATED GROUNDWATER WELLS

Table 6 - Continued

Well Sample ID	Date	Screened Int.(ft.)	Reference: Page(s)
GW-04/8FAXBW02-15 218 N. State Road 1490	08/18/98	NA	Ref. 13, pp. 9 and 36 Ref. 14, pp. 87, 89 and 126 Ref. 31, p. 5
GW-05/8FAXBW02-16 215 N. State Road 1490	08/19/98	NA - 210'	Ref. 13, pp. 10 and 37 Ref. 14, pp. 93, 95 and 126 Ref. 30, p. 133 Ref. 31, p. 5
GW-06/8FAXBW02-01 213 N. State Road 1490	08/19/98	148' - 208'	Ref. 13, pp. 11 and 41 Ref. 14, pp. 6, 8 and 127 Ref. 30, p. 39 Ref. 31, p. 5
GW-07/8FAXBW02-03 210 N. State Road 1490	08/19/98	154' - 224'	Ref. 13, pp. 12-13, 15 and 38 Ref. 14, pp. 18, 20 and 127 Ref. 31, p. 5
GW-09/8FAXBW02-04 210 N. State Road 1490	08/19/98	150' - 225'	Ref. 13, pp. 14 and 39 Ref. 14, pp. 24, 26 and 127 Ref. 30, pp. 40-41 Ref. 31, p. 5
GW-10/8FAXBW02-06 311 N. State Road 1490	08/19/98	118' - 138' 178' - 218'	Ref. 13, pp. 16 and 40 Ref. 14, pp. 33, 35 and 127 Ref. 30, p. 42 Ref. 31, p. 5
GW-11/8FAXBW02-07 335 N. State Road 1490	08/19/98	NA	Ref. 13, pp. 17 and 42 Ref. 14, pp. 39, 41 and 127 Ref. 31, p. 5
GW-12/8FAXBW02-08 1481 McHamm Road	08/19/98	NA	Ref. 13, pp. 18 and 44 Ref. 14, pp. 45, 47 and 127 Ref. 31, p. 5
GW-13/8FAXBW02-09 2312 McHamm Road	08/19/98	170' - 210'	Ref. 13, pp. 19 and 45 Ref. 14, pp. 51, 53 and 127 Ref. 31, p. 5
GW-14/8FAXBW02-10 143 N. State Road 1490	08/19/98	148' - 208'	Ref. 13, pp. 20 and 46 Ref. 14, pp. 57, 59 and 127 Ref. 30, p. 43 Ref. 31, p. 5
GW-15/8FAXBW02-19 1848 W. State Road 114	08/20/98	NA - 180'	Ref. 13, pp. 21-22, 31 and 47 Ref. 14, pp. 108, 110 and 128 Ref. 31, p. 5

NA = Not Available. See Reference 45.

Contaminated Samples:

CONTAMINATED GROUNDWATER WELLS

Table 6 - Continued

Well Sample ID	Date	Screened Int.(ft.)	Reference: Page(s)
GW-17/8FAXBW02-20 149 N. State Road 1490	08/20/98	NA	Ref. 13, pp. 23 and 48 Ref. 14, pp. 114, 116 and 128 Ref. 31, p. 5
GW-18/8FAXBW02-21 1862 W State Road 114	08/20/98	NA	Ref. 13, pp. 24, 30 and 49 Ref. 14, pp. 120, 122 and 128 Ref. 31, p. 5
GW-21/8FAXBW02-11 475 N. State Road 1490	08/19/98	NA - 210'	Ref. 13, pp. 27-28 and 43 Ref. 14, pp. 63, 65, 127 and 129 Ref. 31, p. 5
GW-22/FGD41/MFGR54 2412 McHamm Road	11/10/98	NA	Ref. 15, pp. 3, 8-9 and 16 Ref. 16, pp. 3-8, 16 and 18 Ref. 17, pp. 3-8, 14 and 19 Ref. 31, pp. 1-2
GW-24/FFX37/MFGR50 City Well #15	11/10/98	120' - 220'	Ref. 15, pp. 5, 10 and 17 Ref. 16, pp. 3-8, 16 and 23 Ref. 17, pp. 3-8, 13 and 16 Ref. 30, pp. 82-89 Ref. 31, pp. 1-2
GW-31/FFS50/MFHM77 480 N. State Road 1490	11/10/98	NA	Ref. 15, pp. 3, 6 and 15 Ref. 16, pp. 3-8, 16 and 20 Ref. 17, pp. 3-7, 9, 14 and 21 Ref. 31, pp. 1-2
GW-40/FFX40/MFJE14 512 N. State Road 1490	12/08/98	NA	Ref. 18, pp. 9 and 18 Ref. 19, pp. 3-8, 20, 22 and 28 Ref. 20, pp. 3-8, 11 and 16 Ref. 31, pp. 3-4
GW-44/FFX44/MFJE18 204 Avenue V	12/08/98	168' - 208'	Ref. 18, pp. 13 and 22 Ref. 19, pp. 3-7, 9, 20, 22 and 32 Ref. 20, pp. 3-7, 9, 12 and 20 Ref. 30, p. 44 Ref. 31, pp. 1-2
GW-45/FFX45/MFJE19 402 Avenue X	12/08/98	NA	Ref. 18, pp. 14 and 23 Ref. 19, pp. 3-7, 9, 20, 22 and 33 Ref. 20, pp. 3-7, 9, 12 and 21 Ref. 31, pp. 1-2

NA = Not Available. See Reference 45.

Contaminated Samples: - (continued)

According to the HRS Final Rule, if an observed release to the aquifer has been established, identify each hazardous substance and pollutant or contaminant that establishes an observed release, their concentrations, and the associated SQLs (Ref. 1, p. 51595).

Table 7 HAZARDOUS SUBSTANCES IN CONTAMINATED GROUND WATER SAMPLES

Sample Designation/ ID Number[Date]/ Location	Hazardous Substance	Concentration (ug/L)	SQL (or equivalent)* (ug/L)	Reference: Page(s)
GW-09/6FADW02-09 [10/24/95] 1414 Evening Tower Road	1,2-DCA	33.4	2.0	Ref. 3, pp. 39-45 Ref. 21, pp. 61, 64, 69 and 76 Ref. 31, p. 5
	Vanadium	ND	30.0	
GW-02/6TFADW02-02 [10/24/95] City Well #18	1,2-DCA	16.2	2.0	Ref. 3, pp. 39-45 Ref. 21, pp. 12, 15, 71 and 76 Ref. 31, p. 5
	Vanadium	ND	30.0	
GW-08/7FAXDW13-01 [03/11/97] Edwards Transport, Inc.	1,2-DCA	ND	2.0	Ref. 4, pp. 32-36 Ref. 22, pp. 5, 7 and 71 Ref. 31, p. 5
	Vanadium	37.0	30.0	
GW-02/7FAXDW13-03 [03/11/97] 3058 W Houston	1,2-DCA	ND	2.0	Ref. 4, pp. 32-36 Ref. 22, pp. 16, 18, 67 and 69 Ref. 31, p. 5
	Vanadium	100.0	30.0	
GW-10/7FAXDW13-04 [03/11/97] 1414 Evening Tower Road	1,2-DCA	25.1	20.0	Ref. 4, pp. 32-36 Ref. 22, pp. 22, 24 and 69 Ref. 31, p. 5
	Vanadium	103.0	30.0	
GW-06/7FAXDW13-06 [03/11/97] City Well #18	1,2-DCA	182.0	20.0	Ref. 4, pp. 32-36 Ref. 22, pp. 35, 38, 66 and 68 Ref. 31, p. 5
	Vanadium	ND	30.0	
GW-07/7FAXDW13-07 [03/11/97] 2512 W State Road 114	1,2-DCA	82.2	2.0	Ref. 4, pp. 32-36 Ref. 22, pp. 42, 45, 66 and 68 Ref. 31, p. 5
	Vanadium	36.0	30.0	
GW-03/7FAXDW13-08 [03/11/97] City Well #15	1,2-DCA	ND	2.0	Ref. 4, pp. 32-36 Ref. 22, pp. 48, 50 and 70 Ref. 31, p. 5
	Vanadium	56.0	30.0	
GW-09/7FAXDW13-02 [03/11/97] T&B Services, Inc.	1,2-DCA	ND	2.0	Ref. 4, pp. 32-36 Ref. 22, pp. 11, 13 and 71 Ref. 31, p. 5
	Vanadium	37.0	30.0	
GW-01/8FAXBW02-12 [08/18/98] City Well #21	1,2-DCA	ND	0.5	Ref. 14, pp. 69, 71 and 126 Ref. 31, p. 5
	Vanadium	52.0	30.0	

Notes: (SQL) = Sample quantitation limit is presented in brackets for convenience.
*Method Detection Limit
ND = Not Detected. Concentrations for these constituents were not detected at the reported quantitation limit.

HAZARDOUS SUBSTANCES IN CONTAMINATED GROUND WATER SAMPLES

Table 7 - Continued

Sample Designation/ ID Number[Date]/ Location	Hazardous Substance	Concentration (ug/L)	SQL (or equivalent)* (ug/L)	Reference: Page(s)
GW-02/8FAXBW02-13 [08/18/98] 214 N State Road 1490	1,2-DCA	11.5	0.5	Ref. 14, pp. 75, 77 and 126 Ref. 31, p. 5
	Vanadium	56.0	30.0	
GW-04/8FAXBW02-15 [08/18/98] 218 N State Road 1490	1,2-DCA	17.7	0.5	Ref. 14, pp. 87, 89 and 126 Ref. 31, p. 5
	Vanadium	52.0	30.0	
GW-05/8FAXBW02-16 [08/19/98] 215 N State Road 1490	1,2-DCA	28.4	0.5	Ref. 14, pp. 93, 95 and 126 Ref. 31, p. 5
	Vanadium	40.0	30.0	
GW-06/8FAXBW02-01 [08/19/98] 213 N State Road 1490	1,2-DCA	5.9	0.5	Ref. 14, pp. 6, 8 and 127 Ref. 31, p. 5
	Vanadium	48.0	30.0	
GW-07/8FAXBW02-03 [08/19/98] 210 N State Road 1490	1,2-DCA	18.7	0.5	Ref. 14, pp. 18, 20 and 127 Ref. 31, p. 5
	Vanadium	56.0	30.0	
GW-09/8FAXBW02-04 [08/19/98 210 N State Road 1490	1,2-DCA	8.0	0.5	Ref. 14, pp. 24, 26 and 127 Ref. 31, p. 5
	Vanadium	49.0	30.0	
GW-10/8FAXBW02-06 [08/19/98] 311 N State Road 1490	1,2-DCA	23.5	0.5	Ref. 14, pp. 33, 35 and 127 Ref. 31, p. 5
	Vanadium	60.0	30.0	
GW-11/8FAXBW02-07 [08/19/98] 335 N State Road 1490	1,2-DCA	6.4	0.5	Ref. 14, pp. 39, 41 and 127 Ref. 31, p. 5
	Vanadium	490.0	30.0	
GW-12/8FAXBW02-08 [08/19/98] 1481 McHamm Road	1,2-DCA	ND	0.5	Ref. 14, pp. 45, 47 and 127 Ref. 31, p. 5
	Vanadium	50.0	30.0	
GW-13/8FAXBW02-09 [08/19/98] 2312 McHamm Road	1,2-DCA	ND	0.5	Ref. 14, pp. 51, 53 and 127 Ref. 31, p. 5
	Vanadium	52.0	30.0	
GW-14/8FAXBW02-10 [08/19/98] 143 N State Road 1490	1,2-DCA	ND	0.5	Ref. 14, pp. 57, 59 and 127 Ref. 31, p. 5
	Vanadium	50.0	30.0	
GW-15/8FAXBW02-19 [08/20/98] 1848 W State Road 114	1,2-DCA	2.1	0.5	Ref. 14, pp. 108, 110 and 128 Ref. 31, p. 5
	Vanadium	53.0	30.0	

Notes: (SQL) = Sample quantitation limit is presented in brackets for convenience.
*Method Detection Limit
ND = Not Detected. Concentrations for these constituents were not detected at the reported quantitation limit.

HAZARDOUS SUBSTANCES IN CONTAMINATED GROUND WATER SAMPLES

Table 7 - Continued

Sample Designation/ ID Number[Date]	Hazardous Substance	Concentration (ug/L)	SQL (or equivalent)* (ug/L)	Reference: Page(s)
GW-17/8FAXBW02-20 [08/20/98] 149 N State Road 1490	1,2-DCA	ND	0.5	Ref. 14, pp. 114, 116 and 128 Ref. 31, p. 5
	Vanadium	54.0	30.0	
GW-18/8FAXBW02-21 [08/20/98] 1862 W State Road 114	1,2-DCA	74.7	0.5	Ref. 14, pp. 120, 122 and 128 Ref. 31, p. 5
	Vanadium	ND	30.0	
GW-21/8FAXBW02-11 [08/19/98] 475 N State Road 1490	1,2-DCA	5.7	0.5	Ref. 14, pp. 63, 65, 127 and 129 Ref. 31, p. 5
	Vanadium	49.0	30.0	
GW-22/F DG41/MFGR54 [11/10/98] 2412 McHamm Road	1,2-DCA	2.0	1.0	Ref. 16, pp. 3-8, 16 and 18 Ref. 17, pp. 3-8, 14 and 19, 22 Ref. 31, pp. 1-2 Ref. 50 p. 2
	Vanadium	33.6L	12.3	
GW-24/FFX37/MFGR50 [11/10/98] City Well #15	1,2-DCA	ND	1.0	Ref. 16, pp. 3-8, 16 and 23 Ref. 17, pp. 3-8, 13 and 16, 22 Ref. 31, pp. 1-2 Ref. 50 p. 2
	Vanadium	37.4L	12.3	
GW-31/FFS50/MFHM77 [11/10/98] 480 N State Road 1490	1,2-DCA	2.0	1.0	Ref. 16, pp. 3-8, 16 and 20 Ref. 17, pp. 3-7, 9, 14 and 21, 22 Ref. 31, pp. 1-2, Ref. 50 p. 2
	Vanadium	32.4L	12.3	
GW-40/FFX40/MFJE14 [12/08/98] 512 N State Road 1490	1,2-DCA	ND	1.0	Ref. 19, pp. 3-8, 20, 22 and 28 Ref. 20, pp. 3-8, 11 and 16, 23 Ref. 31, pp. 3-4, Ref. 50 p. 2
	Vanadium	30.6L	2.9	
GW-44/FFX44/MFJE18 [12/08/98] 204 Avenue V	1,2-DCA	ND	1.0	Ref. 19, pp. 3-7, 9, 20, 22 and 32, Ref. 20, pp. 3-7, 9, 12 and 20, 23 Ref. 31, pp. 1-2 Ref. 50 p. 2
	Vanadium	32.0L	2.9	
GW-45/FFX45/MFJE19 [12/08/98] 402 Avenue X	1,2-DCA	ND	1.0	Ref. 19, pp. 3-7, 9, 20, 22 and 33, Ref. 20, pp. 3-7, 9, 12 and 21, 23 Ref. 31, pp. 1-2, Ref. 50 p. 2
	Vanadium	30.1L	2.9	

Notes: (SQL) = Sample quantitation limit is presented in brackets for convenience.
*Method Detection Limit
ND = Not Detected. Concentrations for these constituents were not detected at the reported quantitation limit.
L = Reported concentration is between instrument detection limit (IDL) and contract required detection limit (CRDL).

Observed Release:

An observed release has been documented to the ground water pathway from the water wells identified in Table 7 above by chemical analysis as defined by the HRS Rule (Ref. 1, p. 51589, Table 2-3).

Attribution:

The SSI, ESI, and Addendum to the ESI investigations of the 1,2-DCA and Vanadium contamination have suggested several potential source areas near the ground water plume. Investigations by the TDH, TWC and TNRCC identified nearby facilities and other sources which might have involved 1,2-DCA and vanadium.

1,2-DCA is a clear, thick man-made liquid that is not found naturally in the environment (Ref. 23, p. 1). It is used primarily to make vinyl chloride and a number of other solvents that remove grease, glue and dirt. It is also found in commercial solvents used by industry to clean cloth, remove grease from metal, and break down oils, fats, waxes, resins and rubber (Ref. 23, p. 1). It is also added to leaded gasoline to prevent engine knock and as an insect fumigant for stored grains (Ref. 23, p. 1). Releases to land will dissipate by volatilization to air and by percolation into groundwater where it is likely to persist for a very long time. Little absorption to soil is expected and it rapidly precolates through sandy soil (Ref. 39, p. 2).

Vanadium is a compound that occurs in nature as a white-to-gray metal and is often found as crystals. Pure vanadium has no smell (Ref. 25, p. 2). It usually combines with other elements such as oxygen, sodium, sulfur, or chloride. Vanadium and vanadium compounds can be found in the earth's crust and in rocks, some iron ores, and crude petroleum deposits (Ref. 25, p. 2).

Although, no one facility was clearly identified as the source of the contamination, several potential sources were investigated and/or identified. Potential sources identified consisted of several oil field service related businesses which are located along the south side of State Road 114 (Ref. 3, pp. 16-19; and Ref. 4, pp. 10-19 Ref. 3, p. 11; and Ref. 10, pp. 1, 4-7 and 14, Ref. 3, p. 11; Ref. 10, pp. 1-2 and 8-12; Ref. 11, pp. 1-11), and other oil field service companies and numerous oil and gas production fields have operated within the vicinity of site (Ref. 12, pp. 4 - 5; Ref. 13, p. 29 Ref. 4, p. 54; Ref. 13, p. 29).

While potential sources were investigated, adequate documentation attributing the hazardous substances to one or more of the potential source areas has not been identified according to the HRS criteria. Therefore, a ground water plume (with no identified source) was used as the source for HRS scoring purposes. The ground water plume was characterized as the site source based on the following:

- The plume, although undefined, was established solely by sampling, using the criteria for an observed release to the Ground Water Migration Pathway (see Table 1).

- The level of effort to identify the original source(s) of the hazardous substances was a "Screening Site Inspection" (SSI) Report dated October 1996 (Ref. 3, pp. 16-19), an "Expanded Site Inspection" (ESI) Report dated September 1997 (Ref. 4, pp. 10-19), and

Attribution: - Continued

three subsequent ESI addendum sampling events on August 18-20, 1998 (Ref. 13, pp. 1 - 49; Ref. 14, pp. 1 - 129), November 10. 1998 (Ref. 15, pp. 1 - 20; Ref. 16, pp. 1 - 46; and Ref. 17, pp. 1 - 21), and December 8, 1998 (Ref. 18, pp. 1 - 24; Ref. 19, pp. 1 - 64; and Ref. 20, pp. 1 - 22).

Hazardous Substances Released:

- 1,2-DCA
- Vanadium

As specified in the HRS Rule (Ref. 1, p. 51595), an observed release factor value of 550 was assigned to the Ogallala Aquifer since an observed release by chemical analysis was established to the aquifer.

Observed Release Factor Value: 550

3.1.2 POTENTIAL TO RELEASE

As specified in the HRS Rule, since an observed release was established for the Ogallala Aquifer, the potential to release was not evaluated (Ref. 1, p. 51595).

3.1.3 LIKELIHOOD OF RELEASE FACTOR CATEGORY VALUE

If an observed release is established for an aquifer, assign the observed release factor value as the likelihood of release factor category value for the aquifer (Ref. 1, p. 51601). Since an observed release has been established for the Ogallala Aquifer, the Observed Release Factor Value of 550 is assigned as the likelihood of release factor category value.

Likelihood of Release Factor Category Value: 550

3.2 WASTE CHARACTERISTICS

3.2.1 Toxicity/Mobility

The following toxicity, mobility and combined toxicity/mobility factor values have been assigned to those substances associated with Source No. 1, or present in the observed release, which have a containment value greater than 0.

Table 8

Toxicity/Mobility Factor Values				
Hazardous Substance	**Toxicity Factor Value**	*** Mobility Factor Value**	**Toxicity / Mobility Value**	**Reference**
1,2-DCA	100	1	100	Ref. 2
Vanadium	100	1	100	Ref. 2

Documentation for Toxicity/Mobility Values:

*The Mobility Factor Value for all hazardous substances in an observed release by chemical analysis to one or more aquifers underlying the source(s) at the site, regardless of the aquifer being evaluated, are assigned a mobility factor value of 1 (Ref. 1, p. 51601).

Contaminant characteristic values for hazardous substances found in an observed release to the Ogallala Aquifer were derived from SCDM (Ref.2). The hazardous substance with the highest toxicity/mobility factor value available to the ground water migration pathway is 1,2-DCA (100).

Toxicity/Mobility Factor Value: 100

3.2.2 Hazardous Waste Quantity

Table 9

Source Hazardous Waste Quantity Values		
SOURCE NUMBER	**SOURCE HAZARDOUS WASTE QUANTITY VALUE**	**HAZARDOUS CONSTITUENT QUANTITY DATA COMPLETE?**
1	>0.0	NO
Total	>0.0*	

*According to Section 2.4.2.2. of the HRS Rule (Ref. 1 p. 51592), if the Hazardous Waste Constituent Quantity is not adequately determined for the source, and if any target for a migration pathway is subject to Level I or Level II concentrations, then assign the greater of either value from Table 2-6 or a value of 100, whichever is greater, as the Hazardous Waste Quantity Factor Value for that pathway (Ref. 1, p. 51592).

A Hazardous Waste Quantity Factor Value of 100 is assigned for the ground water migration pathway.

3.2.3 Waste Characteristics Factor Category Value

As specified in the HRS Rule (Ref. 1, p. 51602), the Hazardous Waste Quantity Factor Value of 100 was multiplied by the highest Toxicity/Mobility Value of 100. The resultant product of 10,000 (1.0E+04) was used to select a Waste Characteristics Factor Value of 10 from Table 2-7 of the HRS Rule (Ref. 1, p. 51592).

Hazardous Waste Quantity Factor Value: 100

Waste Characteristics Factor Category Value: 10

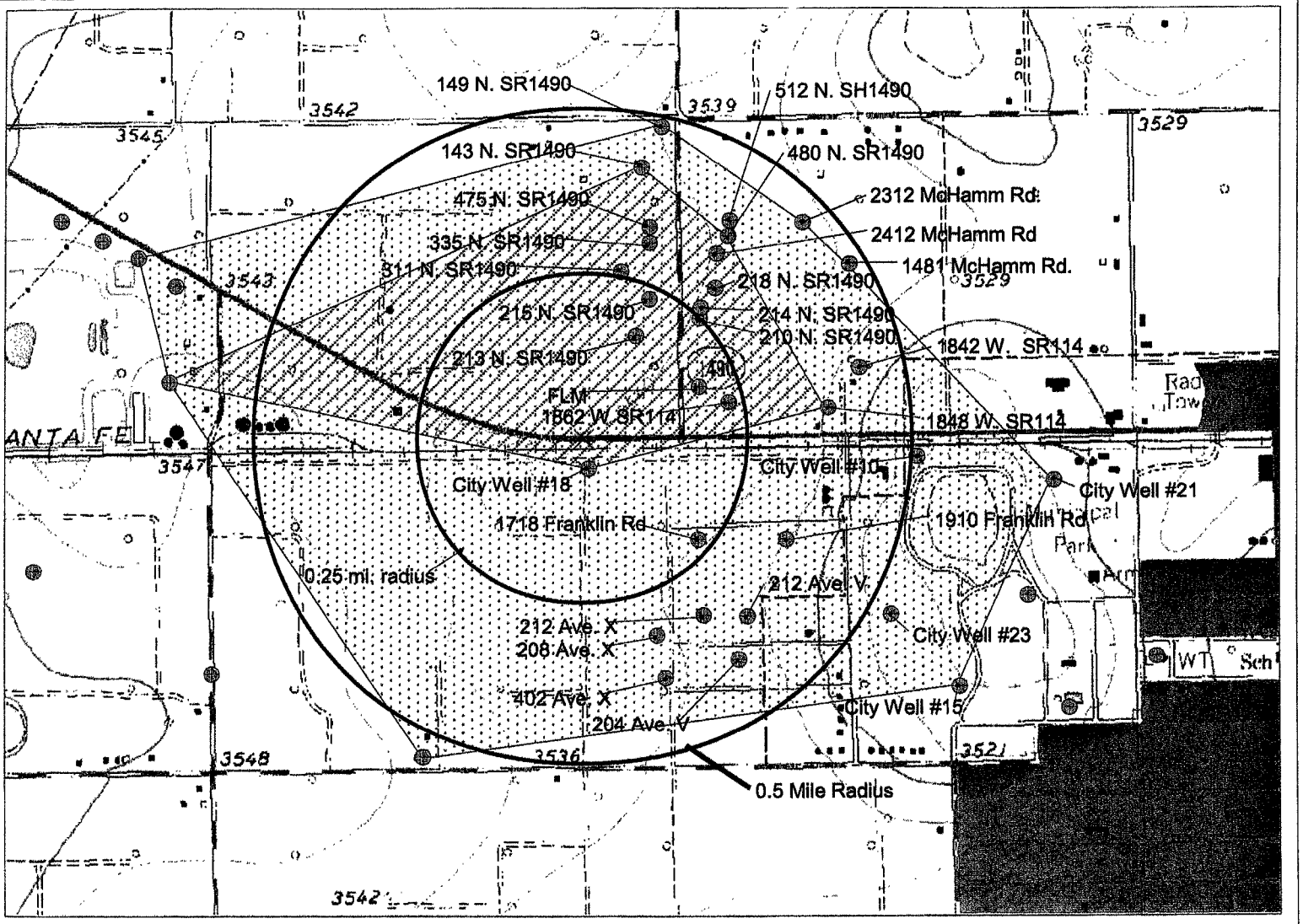
3.3 TARGETS

There are nineteen (19) domestic drinking water wells being evaluated as target wells for the contaminated ground water plume. All of the wells are completed in the Ogallala aquifer. These domestic water wells serve approximately 49 people and are screened at depths ranging from 118 to 224 feet (Ref. 30, pp. 1 - 140). The TNRCC and USEPA have undertaken a response action to purchase, install and maintain water filtration systems on eleven (11) of the private residential water wells which have documented with concentrations above the Maximum Contaminant Limit (MCL) for 1,2-DCA and/or Superfund removal action level for vanadium (Ref. 44, pp. 1-6).

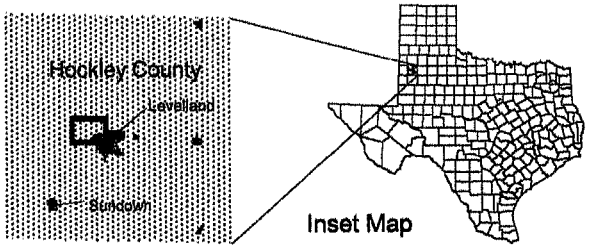
There are fourteen (14) public water supply wells out of 21 total wells that provided a portion of the drinking water needs for the City of Levelland in 1998 (Ref. 40. p. 1). The city water supply is a blend of approximately 21.5% ground water and 80% surface water (Ref. 40, p. 1). The city's water wells serve approximately 3,007 people of a total population of 13,986 (Attachment B and Ref. 40, p. 1). All the city public supply wells are screened at depths ranging from 100 to 260 feet (Ref.30, pp.45 - 140). No active city public water supply wells have been closed at this time. Only two (2) active city public supply wells (#15 and #21) were found to be contaminated with low concentrations of vanadium at levels far below health risk criterion (Ref. 22, pp. 48, 50, and 70; Ref. 14, pp. 69, 71, and 126, respectively). In the 1960's, city Well #18 was abandoned due to bad taste and odor problems with the water produced from that well (Ref. 37, p. 1). During the October 1995 SSI and the March 1997 ESI sampling events concentrations of 1,2-DCA, benzene, ethylbenzene, barium and manganese were found at levels meeting the observed release criteria (Ref. 3, pp. 26 - 27; Ref. 4, pp. 24 - 25). However, this well was not been used as a target well since no analytical sample results exist from the time of its abandonment to document an observed release.

All of the city's active wells are all located down gradient to the east-south-southeast of the site and are screened into the Ogallala Aquifer (See Figures 4 and 5). Five (5) City water wells are located within the ground water plume with the abandoned City Well #18 the only one documented with levels of 1,2-DCA (Figure 3). City Well #10 is approximately 700 feet downgradient of the known leading edge of the 1,2-DCA phase of the plume (Figure 3). The flow of ground water in this area can be affected by the increased pumping from the City wells due to drought or other conditions because the surface water contribution cannot be increased (Ref. 37, p. 1) . Also, 1,2-DCA is a halogenated organic chemical with a molecular weight of 1.235 and a specific gravity that is greater than water (Ref. 39, p. 3). Therefore, 1,2-DCA has a natural tendency to sink to the bottom of an aquifer. The 1,2-DCA would naturally flow with the gradient of the aquifer, but could be influenced by this pumping activity.

All of the city's fourteen (14) active public supply wells are located within the 4 mile target distance limit (TDL) (Figures 3, 4 and 5). City Wells #15 and #21 have been documented with Level II contamination (Ref. 22, pp. 48, 50, and 70; Ref. 14, pp. 69, 71, and 126, respectively). The remaining twelve (12) city public supply wells are subject to potential contamination and have been evaluated for the groundwater migration pathway. A number of unused city water wells and private domestic wells exist within the 4 mile TDL but were not evaluated. The TNRCC and the USEPA are concerned about potential contamination in the area.



0.5 0 0.5 Miles



Drinking Water Wells
DCA Plume
Vanadium Plume

Source: United States Geological Survey
7.5 Minute Series Topographic Map

Protecting Texas by Reducing and Preventing Pollution
TNRCC

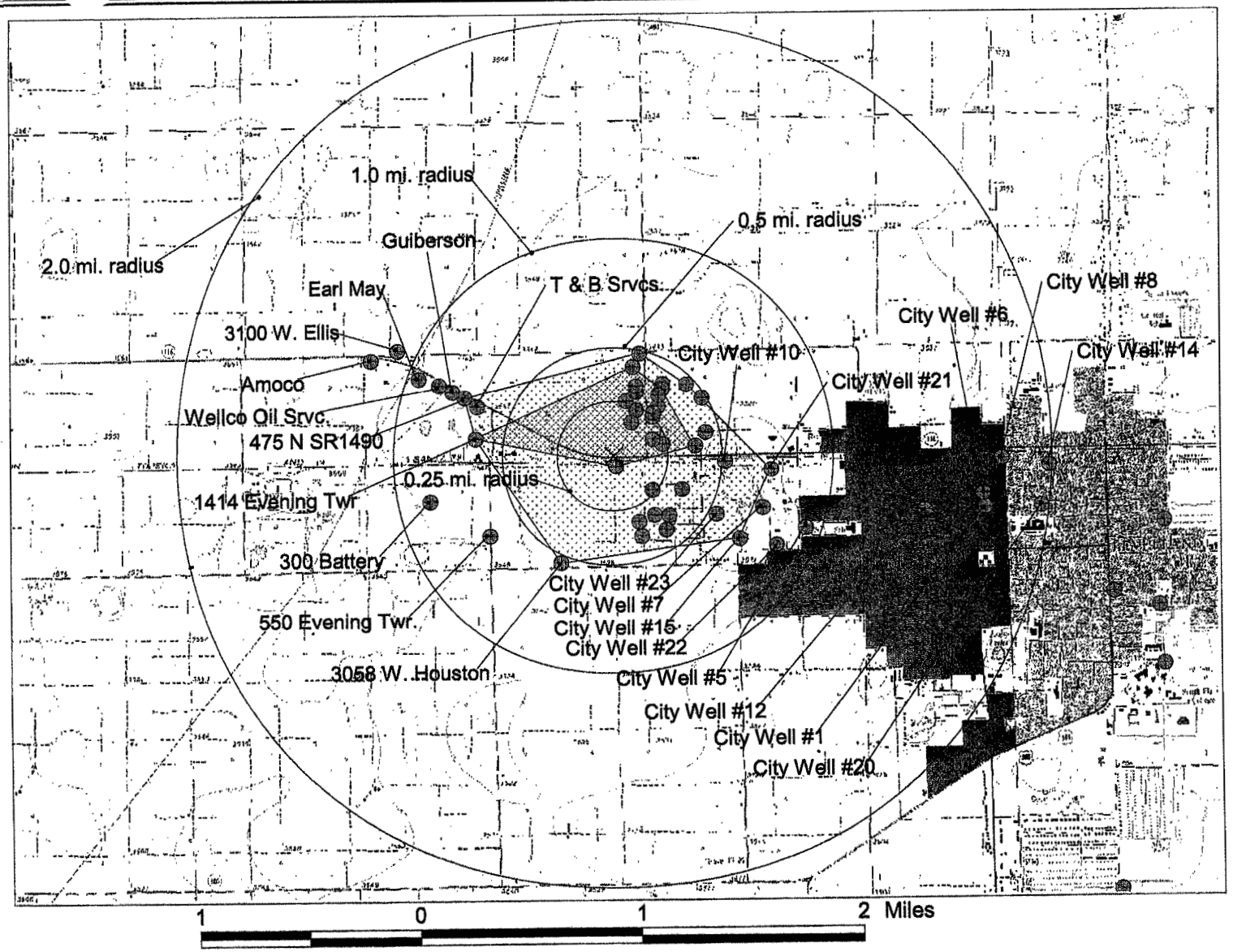
State Road 114 Ground Water Plume TXSFN0605177

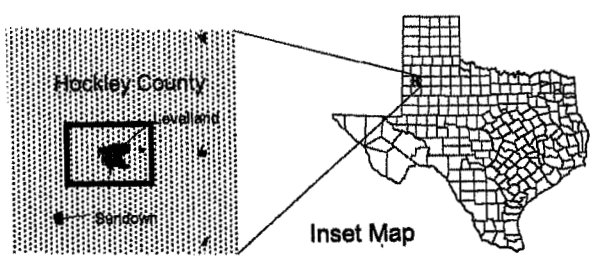
Levelland, (Hockley Co.), Texas

N

HRS Figure 3 Drinking Water Wells Within 0.5 Miles of Vanadium Plume Center

ern 5/14/99





- Drinking Water Wells
- DCA Plume
- Vanadium Plume

Source: United States Geological Survey 7.5 Minute Series Topographic Map

Protecting Texas by Reducing and Preventing Pollution

TNRCC

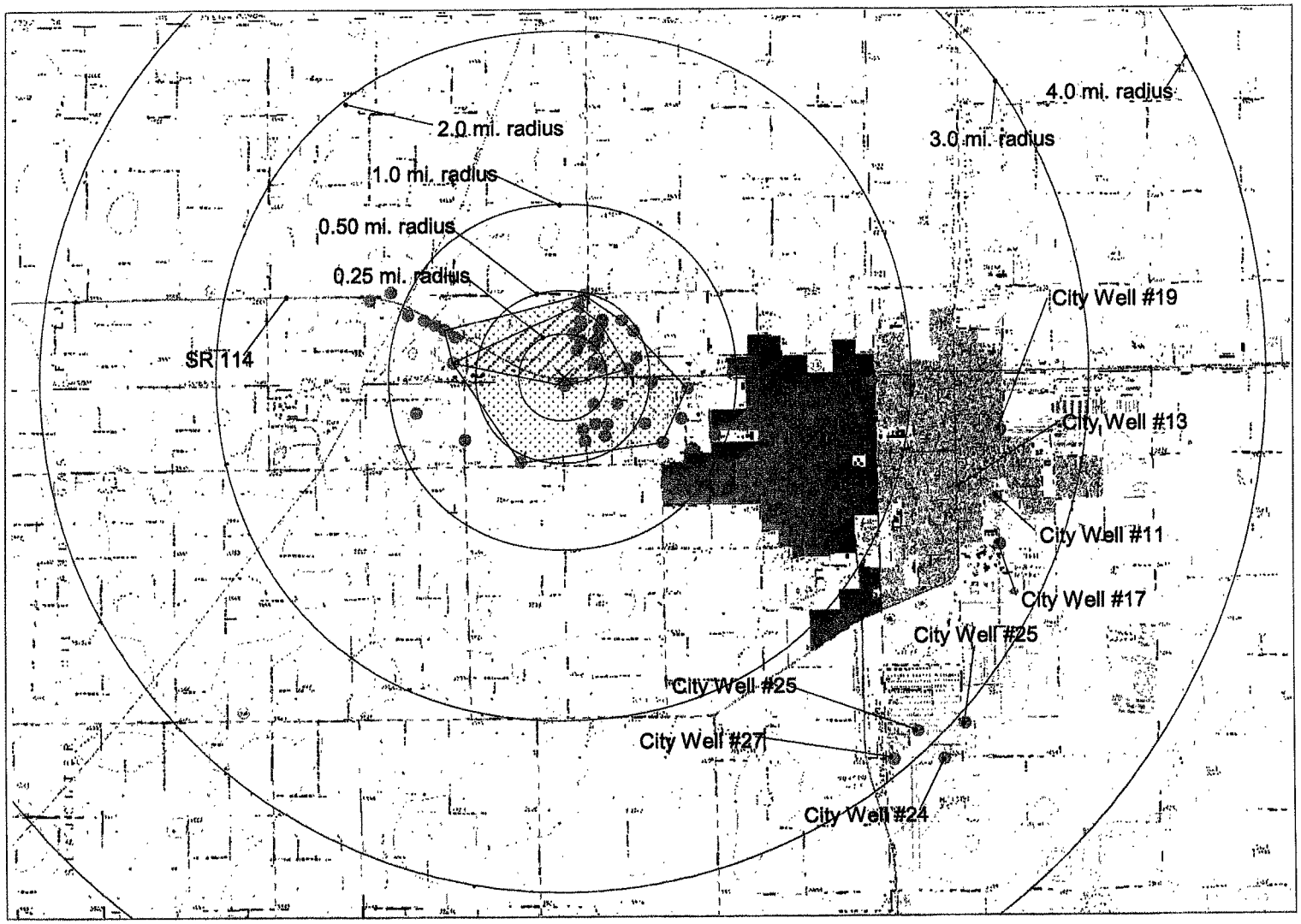
State Road 114 Ground Water Plume TXSFN0605177

Levelland, (Hockley Co.), Texas

N

HRS Figure 4 Drinking Water Wells Within 2.0 Miles of Vanadium Plume Center

ern 5/21/99



TNRCC *Protecting Texas by Reducing and Preventing Pollution*

State Road 114 Ground Water Plume TXSFN0605177

Levelland, (Hockley Co.), Texas

N

HRS Figure 5
Drinking Water Wells Within 4.0 Miles of Vanadium Plume Center

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3.3 TARGETS - (Continued)

The following wells have been identified within the 4-mile Target Distance Limit (TDL) of the site. All wells listed below are constructed within the Ogallala Aquifer (Ref. 30, pp. 1 - 140). The well locations can be seen in Figures 3, 4 and 5.

Table 10

Drinking Water Wells Evaluated within the 4-mile TDL of the Site									
Well Address (State ID No.) [Sample Date]	**Distance from Source**	**Aquifer**	**Screened Interval**	**Total Depth**	**Well Population**	**Level I (Y/N)**	**Level II (Y/N)**	**Potential Contamination**	**Reference: Page(s)**
213 N. State Road 1490 (24-29-2E Dup) [08/19/98]	0 - 1/4 Mile (see Figure 3)	Ogallala	148'- 208'	218'	1	Yes	NE	NE	Ref. 13, pp. 11 and 41 Ref. 30, p. 39
215 N State Road 1490 (NA) [08/18/98]	0 - 1/4 Mile (see Figure 3)	Ogallala	NA	210'	2	Yes	NE	NE	Ref. 13, pp. 10 and 37 Ref. 30, p. 133
210 N State Road 1490 (NA) [08/19/98]	0 - 1/4 Mile (see Figure 3)	Ogallala	150' - 225'	225'	2	Yes	NE	NE	Ref. 13, pp. 12-13, 15 and 38 Ref. 30, pp. 40-41
214 N State Road 1490 (NA) [08/18/98]	1/4 - ½ Mile (see Figure 3)	Ogallala	NA	NA	4	Yes	NE	NE	Ref. 13, pp. 7-8 and 35 Ref. 30, pp. 35-38
335 N State Road 1490 (NA) [08/19/98]	1/4 - ½ Mile (see Figure 3)	Ogallala	NA	NA	2	Yes	NE	NE	Ref. 13, pp. 17 and 42
218 N State Road 1490 (NA) [08/18/98]	1/4 - ½ Mile (see Figure 3)	Ogallala	NA	NA	3	Yes	NE	NE	Ref. 13, pp. 9 and 36
1848 W State Road 114 (NA) [08/20/98]	1/4 - ½ Mile (see Figure 3)	Ogallala	NA	180'	6	Yes	NE	NE	Ref. 13, pp. 21-22, 31 and 47

NA = Not Available. See Reference 45.
NE = Not Evaluated

Table 10 - Continued

Drinking Water Wells Evaluated within the 4-mile TDL of the Site									
Well Address (State ID No.) [Sample Date]	**Distance from Source**	**Aquifer**	**Screened Interval**	**Total Depth**	**Well Population**	**Level I (Y/N)**	**Level II (Y/N)**	**Potential Contamination**	**Reference: Page(s)**
311 N State Road 1490 (24-29-2E) [08/19/98]	1/4 - ½ Mile (see Figure 3)	Ogallala	118' - 138' 178' - 218'	218'	2	Yes	NE	NE	Ref. 13, pp. 16 and 40 Ref. 30, p. 42
475 N State Road 1490 (NA) [08/19/98]	1/4 - ½ Mile (see Figure 3)	Ogallala	NA	210'	2	Yes	NE	NE	Ref. 13, pp. 27-28 and 43
2412 McHamm Road (NA) [08/19/98]	1/4 - ½ Mile (see Figure 3)	Ogallala	NA	NA	2	Yes	NE	NE	Ref. 15, pp. 3, 8-9, and 16
480 N State Road 1490 (NA) [11/10/98]	1/4 - ½ Mile (see Figure 3)	Ogallala	NA	NA	4	Yes	NE	NE	Ref. 15, pp. 3, 5-7, and 15
1481 McHamm Road (NA) [08/19/98]	1/4 - ½ Mile (see Figure 3)	Ogallala	NA	NA	2	No	Yes	NE	Ref. 13, pp. 18 and 44
2312 McHamm Road (NA) [11/10/98]	1/4 - ½ Mile (see Figure 3)	Ogallala	170' - 210'	210'	2	No	Yes	NE	Ref. 13, pp. 19 and 45
143 N State Road 1490 (24-29-2E DUP) [08/19/98]	1/4 - ½ Mile (see Figure 3)	Ogallala	148' - 208'	218'	3	No	Yes	NE	Ref. 13, pp. 20 and 46 Ref. 30, p. 43
149 N State Road 1490 (NA) [08/20/98]	1/4 - ½ Mile (see Figure 3)	Ogallala	NA	NA	2	No	Yes	NE	Ref. 13, pp. 23 and 48

NA = Not Available. See Reference 45.
NE = Not Evaluated

Table 10 - Continued

Drinking Water Wells Evaluated within the 4-mile TDL of the Site									
Well Address (State ID No.) [Sample Date]	**Distance from Source**	**Aquifer**	**Screened Interval**	**Total Depth**	**Well Population**	**Level I (Y/N)**	**Level II (Y/N)**	**Potential Contamination**	**Reference: Page(s)**
512 N State Road 1490 (NE) [12/08/98]	1/4 - ½ Mile (see Figure 3)	Ogallala	NA	NA	4	No	Yes	NE	Ref. 18, pp. 9 and 18
204 Avenue V (24-29-3) [12/08/98]	1/4 - ½ Mile (see Figure 3)	Ogallala	168' - 208'	208'	2	No	Yes	NE	Ref. 18, pp. 13 and 22 Ref. 30, p. 44
402 Avenue X (NA) [12/08/98]	1/4 - ½ Mile (see Figure 3)	Ogallala	NA	NA	2	No	Yes	NE	Ref. 18, pp. 14 and 23
3058 W. Houston (24-29-3B) [03/11/97]	1/4 - ½ Mile (see Figure 3)	Ogallala	132' - 182'	182'	2	No	Yes	NE	Ref. 4, pp. 46, 54 and 62 Ref. 30, pp. 18-22
City Well #21 (24-29-32) [08/18/98]	½ -1 Mile (see Figure 3)	Ogallala	130'- 230'	230'	436	No	Yes	NE	Ref. 13, pp. 5-6 and 34 Ref. 30, pp. 100-110 Attachment B
City Well #15 (24-29-320) [03/11/97]	½ - 1 Mile (see Figure 3)	Ogallala	120' - 220'	222'	400	No	Yes	NE	Ref. 15, pp. 10 and 17 Ref. 30, pp.82-89 Attachment B
City Well #23 (24-29-318) [11/10/98]	½ - 1 Mile (see Figure 3)	Ogallala	132' - 212'	232'	375	No	No	Yes	Ref. 15, pp. 11 and 18 Ref. 30, pp. 118-128 Attachment B
City Well #7 (24-29-309) [Not Sampled]	½ - 1 Mile (see Figure 4)	Ogallala	NA	231'	250	No	No	Yes	Ref. 30, pp. 54-62 Attachment B

NA = Not Available. See Reference 45.
NE = Not Evaluated

Table 10 - Continued

Drinking Water Wells Evaluated within the 4-mile TDL of the Site									
Well Address (State ID No.) [Sample Date]	Distance from Source	Aquifer	Screened Interval	Total Depth	Well Population	Level I (Y/N)	Level II (Y/N)	Potential Contamination	Reference: Page(s)
City Well #22 (24-29-322) [Not Sampled]	½ - 1 Mile (see Figure 4)	Ogallala	127' - 212'	212'	154	No	No	Yes	Ref. 30, pp. 111-117 Attachment B
City Well #5 (24-29-303) [Not Sampled]	½ - 1 Mile (see Figure 4)	Ogallala	NA	231'	307	No	No	Yes	Ref. 30, pp. 45-49 Attachment B
City Well #12 (24-29-305) [Not Sampled]	1 - 2 Mile (see Figure 4)	Ogallala	140' - 240'	240'	64	No	No	Yes	Ref. 30, pp. 70-73 Attachment B
City Well #6 (24-29-315) [Not Sampled]	1 - 2 Mile (see Figure 4)	Ogallala	NA	241'	40	No	No	Yes	Ref. 30, pp. 50-53 Attachment B
City Well #8 (24-30-306) [Not Sampled]	1 - 2 Mile (see Figure 4)	Ogallala	136' - 236'	236'	88	No	No	Yes	Ref. 30, pp. 134-140 Attachment B
City Well #20 (24-30-107) [Not Sampled]	1 - 2 Mile (see Figure 4)	Ogallala	156' - 256'	256'	72	No	No	Yes	Ref. 30, pp. 96-99 Attachment B
City Well #19 (24-30-106) [Not Sampled]	2 - 3 Mile (see Figure 5)	Ogallala	175' - 254'	254'	263	No	No	Yes	Ref. 30, pp. 92-95 Attachment B
City Well #13 (24-30-104) [Not Sampled]	2 - 3 Mile (see Figure 5)	Ogallala	145' - 245'	245'	164	No	No	Yes	Ref. 30, pp. 74-78 Attachment B

NA = Not Available. See Reference 45.
NE = Not Evaluated

Table 10 - Continued

Drinking Water Wells Evaluated within the 4-mile TDL of the Site									
Well Address (State ID No.) [Sample Date]	Distance from Source	Aquifer	Screened Interval	Total Depth	Well Population	Level I (Y/N)	Level II (Y/N)	Potential Contamination	Reference: Page(s)
City Well #11 (24-30-105) [Not Sampled]	2 - 3 Mile (see Figure 5)	Ogallala	100' - 120' 142' - 242'	242'	164	No	No	Yes	Ref. 30, pp. 68-69 Attachment B
City Well #17 (24-30-202) [Not Sampled]	2 - 3 Mile (see Figure 5)	Ogallala	144' - 234'	234'	230	No	No	Yes	Ref. 30, pp. 90-91 Attachment B

NA = Not Available. See Reference 45.
NE = Not Evaluated

3.3.1 Nearest Well

Nearest Well: The nearest well is on-site Well No. 24-29-2E (213 N. State Road 1490).

Level of Contamination (I, II, or potential): Level I

Location of Well: The nearest well, Well No. 24-29-2E (213 N. State Road 1490) is located on-site.

For a well with Level I concentrations, a Nearest Well Factor Value of 50 is assigned (Ref. 1, p. 51603).

Nearest Well Factor Value: 50

3.3.2 Population

3.3.2.1 Level of Contamination

3.3.2.2 Level I Concentrations

Table 11

Well Identification	Well Population	Sample Contaminants	Concentrations (ug/L)	Benchmarks/Screening Concentrations			References for Well Population
				(MCL)/MCLG (ug/L)	Cancer Risk Screen. Conc. (ug/L)	Reference Dose Screen. Conc. (ug/L)	
214 N State Road 1490	4	1,2-DCA	11.5	5.0	0.94	NA	Ref. 13, p. 7
218 N State Road 1490	3	1,2-DCA	17.7	5.0	0.94	NA	Ref. 13, p. 9
215 N State Road 1490	2	1,2-DCA	28.4	5.0	0.94	NA	Ref. 13, p. 10
213 N State Road 1490	1	1,2-DCA	5.9	5.0	0.94	NA	Ref. 13, p. 11
210 N State Road 1490	2	1,2-DCA	13.8	5.0	0.94	NA	Ref. 13, p. 12
335 N State Road 1490	2	1,2-DCA	6.4	5.0	0.94	NA	Ref. 13, p. 17
		Vanadium	490	NA	NA	260.0	
311 N State Road 1490	2	1,2-DCA	23.5	5.0	0.94	NA	Ref. 13, p. 16
1848 W State Road 114	6	1,2-DCA	2.0	5.0	0.94	NA	Ref. 13, p. 21
475 N State Road 1490	2	1,2-DCA	5.7	5.0	0.94	NA	Ref. 13, p. 27
2412 McHamm Road	2	1,2-DCA	2.0	5.0	0.94	NA	Ref. 15, p. 3
480 N State Road 1490	4	1,2-DCA	2.0	5.0	0.94	NA	Ref. 15. pp. 3 and 6

NA - Not Applicable

The concentrations of contaminants shown above include concentrations of a hazardous substance and/or pollutant or contaminant detected in the identified wells that meet or exceed their corresponding benchmark concentrations (Ref. 2, SCDM). An observed release to the Ground Water Migration Pathway has been established based on the detection of these compounds found in the identified wells; thus, these wells are associated with Level I concentrations (Ref. 1, p. 51603).

As specified in the HRS Rule, (Ref. 1, p. 51603), the number of people served by drinking water from points of withdrawal subject to Level I concentrations were summed. The population subject to level I concentrations is 30 and was multiplied by 10, for a product of 300.

Population Served by Level I Well: 30

Level I Concentration Factor Value: 300

3.3.2.3 Level II Concentrations

Table 12

Well Identification	Well Population	Sample Contaminants	Concentrations (ug/L)	References for Well Population
1481 McHamm Road	2	Vanadium	50	Ref. 13, p. 18
2312 McHamm Road	2	Vanadium	52	Ref. 13, p. 19
143 N State Road 1490	3	Vanadium	50	Ref. 13, p. 20
149 N State Road 1490	2	Vanadium	54	Ref. 13, p. 23
512 N State Road 1490	4	Vanadium	30.6	Ref. 18, p. 9
204 Avenue V	2	Vanadium	32	Ref. 18, p. 13
402 Avenue X	2	Vanadium	30.1	Ref. 18, p. 14
3058 W. Houston	2	Vanadium	100	Ref. 4, pp. 54 and 62
City Well #21 (24-29-32)	436	Vanadium	52	Attachment B
City Well #15 (24-29-320)	400	Vanadium	37.4	Attachment B

An observed release to the Ground Water Migration Pathway has been established based on the detection of the above identified compound found in the identified wells; thus, these wells are associated with Level II concentrations (Ref. 1, p. 51603).

As specified in the HRS Rule, (Ref. 1, p. 51603), the number of people served by drinking water from points of withdrawal subject to Level II concentrations were summed. The population subject to Level II concentrations is based on the number of individuals regularly served by private wells and the blended system which includes a total of fourteen (14) City of Levelland wells in 1998, Well Nos. 5 - 8, 11 - 13, 15, 17, 19 - 23 (Ref. 40, p. 1; Ref. 47, p. 5). The City of Levelland system of fourteen (14) public supply water wells provided approximately 21.5% of the City's water needs in 1998 with the balance (approximately80%) coming from surface water (Attachment B; Ref. 40, p. 1). The 1998 water distribution data are used to calculate the population values because these data coincide with the population estimated to have been served by the wells at the time the observed release was established. The total population served by the City of Levelland system in 1998 when the compound was found in private wells and the City of Levelland Well Nos. 15 and 21 was 13,986 (Ref. 46, p. 4). The City of Levelland receives its surface water from the Canadian River Municipal Water Authority through one intake via the City of Lubbock water treatment plant (Ref. 47, p. 7). Therefore, 21.5% (3,007 residences) of the total population was apportioned to each of the fourteen (14) City of Levelland wells based on their respective 1998 production (Ref. 1, p. 51602; Attachment B). The total population of 855 subject to Level II concentrations was divided by 1, for a product of 855.

Population Served by Level II Well: 855

Level II Concentration Factor Value: 855

3.3.2.4 Potential Contamination

Table 13

Well Identification	Distance Category [1]					
	0 to 1/4	>1/4 to ½	>½ to 1	>1 to 2	>2 to 3	>3 to 4
City Well #5 (24-29-303)			307			
City Well #6 (24-29-315)				40		
City Well #7 (24-29-309)			250			
City Well #8 (24-29-306)				88		
City Well #11 (24-30-105)					164	
City Well #12 (24-29-305)				64		
City Well #13 (24-30-104)					164	
City Well #17 (24-30-202)					230	
City Well #19 (24-30-106)					263	
City Well #20 (24-30-107)				72		
City Well #22 (24-29-322)			154			
City Well #23 (24-29-318)			375			
Total Population	0	0	1,086	264	821	0
Distance Weighted Population Value (other than Karst)	0	0	523	30	68	0

1 See Attachment B for computation of individual water supply well populations

An observed release to the Ground Water Migration Pathway has been established based on the detection of compounds found at Level I and Level II concentrations in wells within the 4 mile Target Distance Limit; thus, the above identified wells are associated with potential contamination (Ref. 1, p. 51603).

As specified in the HRS Rule, (Ref. 1, p. 51604), the number of people served by drinking water were determined within in each "Other Than Karst" distance category and a distance-weighted population value for each distance category was assigned. The population subject to potential contamination is based on the number of individuals regularly served by private wells and the blended system which includes a total of fourteen (14) City of Levelland wells in 1998, Well Nos. 5 - 8, 11 - 13, 15, 17, 19 - 23 (Ref. 40, p. 1; Ref. 47, p. 5). The City of Levelland system of fourteen (14) public supply water wells provided approximately 21.5% of the City's water needs in 1998 with the balance (approximately 80%) coming from surface water (Attachment B; Ref. 40, p. 1). The total population served by the City of Levelland system in 1998 when the compound was found in private wells and the City of Levelland Well Nos. 15 and 21 was 13,986 (Ref. 46, p. 4).

The City of Levelland receives its surface water from the Canadian River Municipal Water Authority through one intake via the City of Lubbock water treatment plant (Ref. 47, p. 7). Therefore, 21.5% (3,007 residences) of the total population was apportioned to each of the fourteen (14) City of Levelland wells based on their respective 1998 production (Ref. 1, p. 51602; Attachment B). The Distance Weighted Population Values were summed for a total of 621 and was divided by 10, for a product of 62.1.

Potential Contamination Factor Value: 62.1

3.3.3 RESOURCES

Water wells located at 210 N. State Road 1490, 218 N. State Road 1490 and 1481 McHamm Road are all used to provide water to commercial livestock (Ref 41, p. 1; Ref. 42, p. 1). Therefore, a Resources Factor Value of 5 has been assigned for the Ground Water Migration Pathway (Ref. 1, p. 51604).

Resources Factor Value: 5

3.3.4 WELLHEAD PROTECTION AREA

According to the HRS Rule, if a Wellhead Protection Area (WHPA) is located either partially or fully within an area of observed ground water contamination attributable to the source(s) at the site, assign a value of 20 as the Wellhead Protection Area Factor Value (Ref. 1, p. 51604).

TNRCC data indicates a designated WHPA is not located either partially or fully within the area of observed ground water contamination attributable to the source at the site (Ref. 43, p. 1).

Wellhead Protection Area Factor Value: 0

3.3.5 Calculation of Targets Factor Category Value

The target factor category value is calculated by determining the sum of the factor values for the nearest well (50.0), population (1,217.1), resources (5.0), and Wellhead Protection Area (0.0) (Ref.1, p.51604).

Calculations: 50.0 + 1,217.1 + 5.0 + 0.0 = 1,272.1

3.4 Ground Water Migration Score for an Aquifer

The ground water migration score for an aquifer is calculated by multiplying the factor category values for likelihood of release (550.0), waste characteristics (10.0), and targets (1,272.1). Divide by 82,500, the resulting value (maximum value 100) is assigned as the ground water migration pathway score (Ref.1, p.51604).

Calculations: (550.0 x 10.0 x 1,272.1) ÷ 82,500 = 84.81 (100 maximum)

3.5 Calculation of Ground Water Migration Pathway Score

The Ground Water Migration Pathway Score is calculated by assigning the highest ground water migration score for the Ogallala Aquifer (84.81).

2.1.1 Calculation of HRS Site Score

The HRS site score is calculated by using the root-mean-square equation which squares each pathway score then takes the sum of all four pathways and divides the sum by 4 then takes the square root which is the site score (Ref.1, Section 2.1.1).

Calculations:

Pathway Scores

GW Pathway $[84.81]^2 = 7,193$
SW Pathway NE = 0
Soil Pathway NE = 0
Air Pathway NE = 0
(NE = not evaluated)

$$S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2 =$$
$$7,193 + 0 + 0 + 0 = 7,193$$
$$7,193 \div 4 = 1,798.25$$

square root of which = 42.41

HRS Site Score: 42.41

4.0 Surface Water Pathway

4.0.1 General Considerations

The Surface Water Pathway was not evaluated because the site scored on a contaminated ground water plume. There is no observed release for the Surface Water Pathway.

5.0 Soil Exposure Pathway

5.0.1 General Considerations

The Soil Exposure Pathway was not evaluated because the site scored on a contaminated ground water plume. There is no observed release for the Soil Exposure Pathway.

6.0 Air Migration Pathway

6.1.1 Observed Release

The air migration pathway was not evaluated because the site scored on a contaminated ground water plume. There is no observed release for the Air Migration Pathway.